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ERRATA.

- Vol. 31, No. 3, p. 145, 2nd line of 3rd para, *for* " East and West Africa " *read* " French West and Equatorial Africa "
- Vol. 31, No. 5, p. 334, 13th line from bottom, *for* monobular *read* monolobular (cirrhosis).
- Vol. 31, No. 5, p. 359, LEFROU summary, line 3, *for* " whether " *read* " where."
- Vol. 31, No. 7, p. 481, MASSIAS summary. In translation of title, *for* " or " *read* " and."
- Vol. 31, No. 7, p. 514, GOEZ summary, lines 13 & 14, *for* " spirochaetosis icterohaemorrhagica does not exist in French West Africa " *read* " does exist."
- Vol. 31, No. 12, p. 839, MATHIS summary In translation of title, *for* Liver Virus *read* Living Virus
- Vol. 31, No. 12, p. 854, heading of summary, *for* BAGIOT (Ch.), *read* RAGIOT (Ch.).
- Vol. 31, No. 12, p. 873, MONTEL summary. In translation of title, *for* " Case " *read* " Cure."

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[No. 1.

LEPROSY.

CHINESE MEDICAL JOURNAL. 1933 Mar. Vol. 47. No 3. **Leprosy**
Number. pp. 223-330.

This special number is devoted to an account of the First National Conference on Leprosy of China held at Shanghai in October 1932 and attended by experts from a number of countries. The incidence of leprosy in China was dealt with by James L. MAXWELL, who frankly admitted that no one knows if they number half a million or five millions. The disease is mainly rural and patchy in its distribution, and the southern provinces are most affected. He suggests that if the staff of the hospitals would make notes of the places from which lepers came for treatment and map them out, much information could soon be accumulated regarding the incidence of leprosy. H. W. WADE contributed an interesting paper on the organization of leprosy research and he emphasized the need for a diagnostic serum test for early cases and for both clinical and bacteriological research. L. F. HEIMBURGER reported good results in treatment from combining gold preparations with hydnocarpus compounds. S. N. D. FRASER reported favourably on out-patient treatment by alepol followed by ethyl esters, especially iodized esters, intradermally and intramuscularly in cutaneous cases. Compulsory segregation in China only leads to hiding of cases. From Hangchow S. D. STURTON reports a rapidly increasing number of patients with a new spirit of hopefulness. The problems of segregation and the care of arrested cases is dealt with by C. M. HASSELMANN with experience in Central America and India and six years in the Philippines. In the latter the long coast line is most affected, he places the numbers at between 14,000 and 70,000 among 12 million people, and at the end of 1931 about 6,984 were segregated. Only under the highly civilized conditions of Europe has segregation succeeded, as in Scandinavia. "In all other countries—the Philippines, Africa, the West Indies, Hawaii and even in Australia—compulsory segregation has not been an effective method of stamping out leprosy, and has not resulted in any material reduction in the number of annual admissions of new cases." In support of this statement a table is given of the number of cases segregated and the yearly new admissions from 1915 to 1931, and he adds that about 32 per cent. of the annual budget of the Philippine Health Service has been spent on leprosy and the Culion settlement; he thinks that the control of this presumably contagious disease "lies

more on the lines of those principles and aims advocated by British leprologists in India," *i.e.*, by discovering and treating the early amenable cases and frequent examinations of all contacts, although obtaining adequate out-patient attendance is admitted to be a serious difficulty. For the arrested and bacteriologically negative cases he advises attractive settlements without too rigid rules.

A round-table conference was held on the present position and future prospects of leprosy work in China. It advised that all properly organized bodies interested in leprosy work be encouraged and Government control be limited to registration and inspection of leper establishments. The disease to be notifiable. Dispensaries, hospitals and homes for treatment to be provided with a central institution for research, and training physicians in the treatment, etc., in each seriously affected province, with periodic inspection of the families of lepers and the prohibition of certain trades. A second conference is to be held after two years.

L. Rogers.

LEPROSY REVIEW 1933. July. Vol. 4. No. 3. pp. 90-134. With 10 figs. Quarterly Publication of the British Empire Leprosy Relief Association, 29, Dorset Square, London, N.W.1.

Ridding Palestine of leprosy is dealt with by T. CANAAN, who estimates the number of lepers in Palestine at about eighty, with about 100 more in Trans-Jordan and Syria; only 21 are in the Jerusalem Moravian home. The disease shows very little infective power, although the people dread it and make lepers live at some distance from their houses. In such a small country with few lepers he thinks compulsory segregation is the best policy as regards all infective cases. There should be a two and a half to three years' period of negative bacteriological findings before discharge and frequent re-examinations. All relatives and near neighbours should be examined six monthly for two years to discover hidden and early cases, and all children born to lepers should be separated from their parents. The Leper Home is prepared to take 80 to 100 patients.

Non-specific serological tests in leprosy are discussed by A. MCKENZIE of East Africa, who concludes that the serum formalin reaction with the scale of Dye is of greater diagnostic value as regards the activity and progress of cases than the sedimentation index, since the latter is affected by all forms of debility.

The use of Brilliant green and Crystal violet in the treatment of leprosy is advocated by C. S. RYLES, who has used the method of G. A. Ryrie and thinks it is as good as hydnocarpus oil derivatives, safe, cheap and not unduly painful. [See RYRIE's paper below.] *I. R.*

LEPROSY IN INDIA. 1933. July. Vol. 5. No. 3. pp. 113-175. With 4 plates. Issued quarterly by the Indian Council of the British Empire Leprosy Relief Association.

This number opens with an account of a three days' Leprosy Conference held in Calcutta in March 1933, and convened by the Indian Council of the British Empire Leprosy Relief Association to discuss the methods of combating leprosy in India. The following conclusions were arrived at. Extension and co-ordination of anti-leprosy work as part of the Public Health System is required through the appointment of a specially trained leprosy officer for each province, with a Provincial

Leprosy Board containing representatives of missions, the leprosy association, etc., together with district leprosy boards to co-ordinate measures in each district. Training by a leprosy expert of the students in all medical schools and of sanitary inspectors to be provided, together with special leprosy clinics and others attached to each hospital, while infectious cases should be treated as far as possible in hospitals. Research, the examination of all children for early leprosy, and after-care farm colonies are also advised.

Extracts of replies regarding the intradermal treatment of leprosy show the oil to be less painful and much cheaper than the esters, and all the contributors favoured the use of this method as more rapid in its effects.

L. R.

LOWE (John). **Epidemiology of Leprosy in Hyderabad (Deccan), India.**
—*Internat. J. Leprosy*. Manila. 1933. Jan. Vol. 1. No. 1.
pp 17-30 With 1 fig.

A survey of about 122 villages revealed a leprosy rate of about 1 per cent., and Mohammedans showed a high rate, especially among the depressed classes. Males are affected twice as much at all ages as females. Careful inquiries into the histories of 400 cases indicated that the organism is inoculated into the skin or mucous membrane as the result of long and intimate contact with infected lepers, but conjugal infection is very rare, only one in the 400 cases. The joint family system, with several married sons and their families living with their father, favours its spread, for contact is not avoided until the disease is advanced. Of the 400 cases leprosy was contracted from the parent in 78, from brothers and sisters in only 28, but from other relatives living in the same house in 125. The time of onset showed the disease to have developed in 20 per cent. by the age of 10 years, in 40 by 15, in 60 by 20, in 80 by 25 and in 92 per cent. by 30 years of age, so that in most cases clinical signs appear before the age of twenty, and the disease is usually contracted in childhood. Adults are usually immune, but there may be occasionally a long latent period of years. This is all in accordance with former experience.

L. R.

HOFFMANN (W. H.). **Leprosy and the Cultural Development of Africa.**
—Reprinted from *Africa*. 1932. Vol. 5. No. 4. pp. 455-463.

This is a clear statement of the modern methods of prophylaxis against leprosy, designated "the curse of Africa," based on the fact that by the discovery and efficient treatment of the early stages the great majority can be cleared up and prevented from going on to the infective stage. The ancient system of universal compulsory segregation may now do more harm than good in causing the early cases to be hidden, for fear of life-long imprisonment, until it is too late for their effective treatment and until they have already infected members of their households and other contacts. We already know of 500,000 lepers in Africa, and the real numbers are not less than one or two millions, so in any case compulsory segregation would be impossible. Something is being done by voluntary isolation in leper villages and colonies, but what is most wanted is the creation of the necessary treatment centres all over the continent, and the author pays a

tribute to the work of the British Empire Leprosy Relief Association in "so actively fighting against leprosy with modern methods in all parts of the world" and on these lines in Africa. A Leprosy Research Institute for training experts is also needed. *L. R.*

BERNY. Création et organisation d'un village de lépreux au Moyen-Congo. [**A Leper Village in Moyen Congo.**]-*Ann. de Méd. et de Pharm. Colon.* 1933 Jan.-Feb.-Mar. Vol. 31. No. 1. pp. 68-77.

This is an interesting account of a prophylactic measure in French Congo territory where any attempt at compulsion fails completely through wholesale hiding of the lepers. The author wisely waited until he had gained the confidence of the indigenous inhabitants, opened a dispensary for voluntary out-patient treatment of lepers, and then organized a village for the residence of lepers and their families, away from other villages but easily reached by motor road and got the administration to exempt the occupants from taxes while land was provided for growing their food; a leper chief was appointed under whom they live just as they would in the native villages. The necessity for prolonged treatment is explained with the hope of eventual return home if they recover. The unmarried of the two sexes are separated and all children born to the married are isolated from the first. After a year a second village was required within reach of treatment of those of a different tribe. Thus isolation and treatment of a number of lepers has been obtained without compulsion. *L. R.*

JOSEPH (M. Gaston). La lutte contre la lèpre en Afrique Occidentale Française. [**Antileprosy Measures in French West Africa.**]-*Bull. Office Internat. d'Hyg. Publique.* 1933. Apr. Vol 25 No. 4. pp. 602-603.

This brief paper describes how in French West Africa the old cruel and useless method of reliance solely on compulsory segregation of lepers is being replaced by surveys and examinations to ascertain the number and infectivity of the patients. Uninfective cases are treated by weekly visits to dispensaries without isolation, and infective ones at special hospitals and colonies, with dispensary treatment for those who become uninfective, and village sanatoria and a central leprosy institute for the others. Research is provided for under a specialist, and a crèche is provided for the reception of the infants of infective mothers during the treatment of the latter. *L. R.*

VINUESA (Angel). La lepra en la provincia de Tarragona. [**Leprosy in Tarragona Province.**]-*Rev. San. e Hig. Pública.* 1933. Mar. Vol. 8. No. 3. pp. 251-257.

The author states that the leper census reports 48 cases in the Province of Tarragona, Spain, but since these have advanced lesions, the number is probably greater, "at least double." Thirty-two were in the district of Tortosa, 15 in the close neighbourhood, the origin of the other was not known. Twenty-eight were males, 20 females. The population of the Province is 350,668, of whom 100,398 are in Tortosa district. It would appear that Tortosa is the endemic focus, sporadic cases only being encountered in other parts of the Province.

H. H. S.

LAMPE (P. H. J.). **Fate of Children Born of Leprous Parents in the Groot-Chatillon Leprosy Asylum.**—*Internat. Jl. Leprosy*. Manila. 1933. Jan. Vol. 1. No. 1. pp. 5-15. With 1 fig.

In the Groot-Chatillon Government leprosy asylum of Dutch Guiana married lepers may live together and any children are removed from their parents at 6 to 9 months of age. To 29 women at present in the asylum between the ages of 15 and 40, who have lived a total number of 267 years in the asylum, 71 children have been born and the coefficient of fertility of the isolated native women is 7·8 against 6·3 among non-leprous women of Surinam, so the lepers are fully fertile. The fate of 99 out of 105 children of leprous women in 32 years has been studied; 65 are alive and 34 have died. None of those dying under 3 years showed leprosy and only 2 of 6 older children dying developed it. The mortality among the children of mothers giving positive Wassermann reactions was much higher than the negative ones, possibly due to syphilitic and yaws infections. Of a total of 69 traced children who survived the first year 18 or 26 per cent. developed leprosy, and the disease appeared between the 4th and 8th years in 23·3 of the 26 per cent. There are indications that at least 60 per cent. of the children who contracted the disease were infected or reinfected at a later age after leaving the asylum. The incubation period of those considered to have been infected in the asylum was about two years. The conclusion is come to that the children of lepers should be separated from their parents directly after birth and they should not be brought up by members of the families of patients, but should be looked after by Government. Those who contract leprosy at an early age are very expensive cases for Government to segregate, perhaps for life, for there are Surinam lepers of over 80 years of age who were born in asylums and spent their whole lives there. L.R.

CHIYUTO (Sulpicio). **Early Leprotic Changes in Children and their Bearing on the Transmission and Evolution of the Disease.**—*Monthly Bull. Bureau of Health*. Manila. 1933. Jan. Vol. 13. No. 1. pp. 5-48. With 8 figs. on 4 plates. [23 refs.]

This is an interesting and detailed study of clinical and pathological conditions of the skin of forty children whose parents were lepers, with whom they had lived a year or two before being separated from them. The lesions met with included multiple depigmented areas or macules which appeared simultaneously in different sites of the skin that had been in intimate (skin to skin) contact with their leprous parents during infancy. Minute pinkish papulo-vesicular eruptions in groups and rather goose-flesh in aspect, were also common, together with flushing, glistening and tense condition of the skin of the legs. Perivascular round-celled infiltration was found microscopically in these lesions, while more developed macular lesions showed the changes of tuberculoid leprosy with giant celled formation, but typical *Mycobacterium leprae* were not demonstrated in the lesions except in one case. These observations are held to contradict the single point of entry of infection in favour of multiple skin infection through contact with infected mothers during infancy, and the lesions appear to be progressing, this suggests a granule stage of the bacillus as their cause, and the author agrees with RODRIGUEZ that drug treatment does not prevent these early developments of leprosy in young children. L. R.

SEELEY (S. F.). **A Trip to Cullion Leper Colony.**—*Milit. Surgeon.* 1932. June. Vol. 70. No. 6. pp. 597-606. With 13 figs.

This naval medical officer described what he was shown of leprosy during a short trip to this much-reported-on leper settlement. The most interesting statement in the article is that "The number of patients developing advanced leprosy is becoming less each year under the intensive treatment with Chaulmoogra ester." *L. R.*

TISSEUIL (J.). Le problème de la lèpre en 1932. [**The Leprosy Problem in 1932.**]—*Ann. de Méd. et de Pharm. Colon.* 1933. Jan-Feb.-Mar. Vol. 31. No. 1. pp. 63-67.

This is a brief summary of work on leprosy published last year. The author points out that the examination of recruits shows that the disease has not decreased in Japan and that in Dutch Guiana compulsory segregation has been given up. *L. R.*

URUEÑA (Jesus Gonzalez). **Leprosy Proteus.**—*Arch. Dermat. & Syph.* 1933. Mar. Vol. 27. No. 3. pp. 450-459. With 11 figs.

The author describes and illustrates some of the less typical clinical forms of leprosy. These include vitiligid, psoriasisform, ichthyosiform, hybrid leprous and congenital ichthyosis, syphiloid lepromatous alopecia and neurodermitic lichenoid leprid varieties. *L. R.*

MARKIANOS (J.). La bacillémie et la fièvre lépreuse. [**Bacillaemia and Leprous Fever.**]—*Ann. Dermat. et Syph.* 1933. Mar. 7th Ser. Vol. 4 No. 3. pp. 220-229. With 4 figs.

This is a good account of the well known febrile reactions of leprosy with some temperature charts. In the nodular cases Hansen's bacillus can be found in the blood by examining thick drops stained as for Koch's tubercle bacillus during the febrile stage, and they are also not rarely found in mixed cases, but not in nerve cases. Treatment is symptomatic and aspirin, quinine, antipyrine, caffeine, diuretics and tonics are recommended. *L. R.*

COTTINI (Gian Battista). Contributo allo studio di tre casi di lepra con particolare riguardo alla bacillèmia. [**Bacillaemia in Leprosy.**]—*Giorn. Ital. di Dermat. e Sifil.* 1933. Feb. 68th Year. Vol. 74. No. 1. pp. 84-113. With 6 coloured figs. on 1 folding plate. [33 refs.]

This long and very detailed paper may be summarized by saying that the author examined the blood, 10 cc. taken by venepuncture, from three patients with leprosy, one showing an eruption resembling erythema nodosum, the other two with leproma nodules. The blood was treated as follows :—

To the 10 cc. were added 5 cc. of 3 per cent. acetic acid and the mixture cautiously shaken, avoiding frothing, after which it was set aside for 30 minutes, then centrifuged for 30 minutes at 3,000 r.p.m. The deposit was mixed with 15 cc. of 35 per cent. anti-formin and shaken well to render it homogeneous; 15 cc. alcohol was next added and the whole again centrifuged for half an hour; the residue after being washed with distilled water and a final centrifuging was spread on a slide and stained by the Ziehl-Neelsen method.

Positive results were obtained on certain occasions when the blood was withdrawn during a bout of fever, but once only during apyrexia. Examination of the cerebrospinal fluid and urine was negative, as were also the results of all attempts at culture and animal inoculation. Appended to the article is a plate with six excellent illustrations.

H. H. S.

i GIRARD (G) & WOLTZ (H.). La cholestérolémie chez les lépreux de Madagascar. [**Cholesteræmia in Lepers of Madagascar.**]*—Bull. Soc. Path. Exot.* 1933 May 10. Vol. 26. No. 5. pp. 702–704.

ii. —. A propos de la cholestérolémie chez les lépreux.—*Ibid.* June 14. Vol. 26. No. 6. p. 769.

i. Estimations of cholesterin in 100 native lepers showed the normal mean figure for the same race of 1·10 gm. in nerve leprosy, but the low mean figure of 0·95 in nodular and mixed cases.

ii. In this note attention is drawn to a former paper of A. MARRAS showing similar results to theirs in Madagascar. They also state that the cholesterin in the serum of lepers can be increased by prolonged treatment with chlorhydrate of choline.

L. R.

KUPFFER (A.). 32 Jahre Lepratherapie. [**Thirty-Two Years of Leprosy Treatment.**]*—Arch. f. Schiffs- u. Trop-Hyg.* 1933. Aug. Vol. 37. No. 8. pp 373–380.

This is an historical account of the various treatments used by the author in the past thirty years at the Juda leprosarium in Estonia. They include chaulmoogra oil and Unna's sodium and magnesium gynecardate pills orally, nastin, the injection of the oil and antileprol and gold preparations such as krysolgan, as well as iodides orally and ichthyol as a local preparation and carbon dioxide snow. No data of the results obtained with the different preparations are given, but the general conclusion is come to that in the first stages of the disease the prognosis under present treatment is distinctly more favourable than in more advanced cases.

L. R.

TOMB (J. Walker). Chaulmoogra Oil and its Derivatives in the Treatment of Leprosy.—*Jl. Trop. Med. & Hyg.* 1933. June 15, July 1 & 15. Vol. 36. Nos. 12, 13 & 14. pp. 170–178; 186–189; 201–207.

This is a lengthy summary of the literature on the subject with useful references.

L. R.

FERRÉ. Préparation anti-lépreuse à partir d'huiles de caloncobas du Cameroun. [**An Anti-leprous Preparation from Oil of Caloncoba in Cameroon.**]*—Ann. de Méd. de et Pharm. Colon.* 1933. Jan.–Feb.–Mar. Vol. 31. No. 1. pp. 78–83.

This is a short paper on preparations from a local chaulmoogra-containing oil in West Africa.

L. R.

RYRIE (Gordon A.). **A Preliminary Report on the Action of Certain Dyes in Leprosy.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. June 29. Vol. 27. No. 1. pp. 85-92.

This is an interesting and promising report on the trial of a number of solutions of dyes intravenously in 85 cases of leprosy at the Federal Leper Settlement, Federated Malay States. Trypan blue, brilliant green, fluorescein and eosin out of fourteen preparations tried produced clinical improvement, often after a single injection although previous and subsequent ones had no effect; their action is therefore irregular, but the results compare favourably with those obtained with chaulmoogra preparations and without much reaction. Selective staining with relative concentration in the leprotic lesions was observed. Strong sterile filtered solutions were used, such as 15 to 20 cc. of a 1 per cent. solution of brilliant green, 25 to 75 cc. of a 4 per cent. one of trypan blue, 8 cc. of a 2 per cent. solution of fluorescein, which may be combined with brilliant green, and 25 cc. of a 2 per cent. eosin. The later effects of this line of treatment are not yet known but further trials are indicated. L. R.

SOUCHARD & ROTON. Observation d'un cas de lèpre traité par le savon-total de Krebao. [**A Case of Leprosy treated with Krebao Soap.**—*Bull. Soc. Path. Exot.* 1933. June 14. Vol. 26. No. 6. pp. 769-772.

The authors report on the use of a soap made from the oil of Krebao (*Hydnocarpus anhelmuntica*) prepared in the Saigon Pasteur Institute. The results surpassed their hopes, but did not amount to a complete cure, they exceeded, however, anything due to spontaneous retrogression. The drug is also absorbed without trouble when given orally, and this is of great practical importance in Indochina, where the inhabitants prefer oral to other forms of treatment. L. R.

RODRIGUES (Sebastian L.). **Treatment of Leprosy and Other Bacterial Infections by Neoquinine.**—*Calcutta Med. Jl.* 1933. Mar. Vol. 27. No. 9. pp. 319-328. With 7 figs. on 4 plates.

Neoquinine made in Calcutta is stated to be the "soluble monophenyl-sulphonate of quinine" and it is claimed to be a powerful bacteriostatic in certain bacterial diseases, including leprosy, of which "seven cases have been treated on these lines with remarkable success." L. R.

LOEWENSTEIN (E.). **Bacteriological Diagnosis of Leprosy by Means of Blood Culture.**—*Internat. Jl. Leprosy.* Manila. 1933. Jan. Vol. 1. No. 1. pp. 39-44.

The author first refers to his work on cultivating the tubercle bacillus from the blood in lupus erythematosus, with 100 per cent. positive after four examinations, and in other conditions and he refers to the frequent complication of leprosy with tubercular infections. For cultures from the blood of lepers he employs a special asparagin solution with milk, egg, etc., the asparagin replacing peptone as the source of nitrogen. This is inoculated with sediment of sterile blood after centrifuging, removing the serum and dissolving the red corpuscles with sterile distilled water. This sediment can safely be subjected to concentrations of sulphuric acid not greater than 5 per cent., and cultures are still obtained. L. R.

DENNEY (O. E.) & EDDY (Bernice E.). **Leprosy : Comments on in vitro Behavior of Lepra and Certain Other Acid-Fast Micro-Organisms in Presence of Leukocytes.**—*Arch. Dermat. & Syph.* 1933. May. Vol. 27. No. 5. pp. 794-804. With 6 figs.

Denney reports that for more than fifteen years he has attempted to cultivate acid-fast organisms from lepers by incubating leprous pus cells or leprous material with nonleprous rabbit's leucocytes in normal saline or Tyrode's solution. More than fifty acid-fast bacilli from various sources have been used in the experiments, and he has obtained phagocytes distended with the bacilli which appeared to be multiplying in them in some cases. Those of rat leprosy showed considerable chemotactic affinity for the leucocytes, and after twenty-four hours showed both extracellular clumps and intracellular inclusions distending and distorting the cell wall and presenting the pictures of the "lepra cell" or the "signet ring" of Hansen and indistinguishable from globi. Altogether eleven of the strains tested were distinctly attracted to the leucocytes. Acid-fast bacilli contained in leper juice, however, did not show proliferation of acid-fast bacilli or globi when suspended with living leucocytes, but those from leprous abscesses did show increase in the number and size of the globi with proliferation on the addition of living leucocytes.

L. R.

SUCH SANCHIZ (Manuel). Intentos de cultivo del B. de Hansen. [**Cultivation of *Mycobacterium leprae*.**—10 pp. With 8 plates (6 coloured). 1933. Madrid. Comisión Permanente de Investigaciones Sanitarias, Dirección General de Sanidad.

The author gives an account of his cultures of four strains of *Myco. leprae* isolated, one from nasal mucus and three from lepromata. The medium he uses is composed of whole egg, placental broth (human and bovine) and orange juice in equal parts, of pH 7-7.2, heated to 75-80°C. for a quarter of an hour on three successive days. At the beginning a growth was visible in 8 days, but later in 48 hours. The organism is rod-like and resists 3 per cent. acid alcohol for 2 hours. It is Gram-positive, sometimes granular, sometimes homogeneous. With the Ziehl-Neelsen stain most of the bacilli show these granules, with Gram many are granular throughout.

He carried out inoculations into laboratory animals, guineapigs, rabbits, white rats and monkeys, intraperitoneally and into the anterior chamber of the eye. The cultures proved non-pathogenic. The author regards such animals as died as not being killed by the organism. He tested also for allergy; an emulsion of the organism injected intradermically into lepers and "all but three showed a nodular reaction persisting to the tenth day" [but the number of subjects is not stated]. Fixation of complement gave unreliable results, since several of the leprous sera fixed also with an antigen of *Myco. tuberculosis*.

H. H. S.

SCHLOSSMANN (K.). Die Kultivierung des Lepraerregers. II. Mitteilung. [**Cultivation of the Leprosy Bacillus.**—*Zent. f. Bakt.* I. Abt. Orig. 1933. May 22. Vol. 128. No. 5/6. pp. 369-381. With 2 figs. [13 refs.]

The author reports further on his researches on the cultivation of the lepra bacillus in the Martin bouillon medium with a view to obtaining

sub-cultures, which has always presented great difficulties. He reports and illustrates six months cultures of the first generation and two months culture of the second generation on agar medium, and he finds that the leprosy bacilli multiply relatively well as long as the smallest suspicion of human material is present; the first cultures were obtained by transplanting pieces of human leprosy-bacilli containing tissues, from which the organisms grew out into the medium. *L. R.*

ARAÚJO (H. C. de Souza). Essais de culture du *Mycobacterium leprae* (*Coccithrix leprae*, Lutz 1886) par la méthode de Sumiyoshi-Shiga. [Attempts to cultivate *Myc. leprae* by Shiga's Method.] *Internat. Jl. Leprosy*. Manila. 1933. Jan. Vol. 1. No. 1. pp. 45-47.

This short paper reports the failure to cultivate the leprosy bacillus by the method of SHIGA, owing the author thinks to many of the bacilli in skin lesions being dead or to the injurious action on them of dilute sulphuric acid. The success of OTA in growing acid-fast bacilli from the blood of lepers indicates that LOEWENSTEIN's method is preferable to that of SHIGA. *L. R.*

REED (G. B.). Dissociation of *Mycobacterium leprae*.—*Jl. Bacteriology*, 1932 Nov. Vol. 24. No. 5. pp. 357-378. With 2 figs. & 1 plate. [12 refs.]

After reference to earlier work on the dissociation of the tubercle bacillus, the author records work on similar lines on fourteen stock laboratory cultures of "*Mycobacterium leprae*" supplied by the National and the American type culture collections, and including the organisms of Clegg, Kedrowsky-Kraus, Duval, etc. Cultures were made on Petroff's gentian violet-egg medium, which allowed the colonies to be differentiated into R colonies, growing most characteristically as "a cone with an irregularly circular outline and sides sloping abruptly to a peak" and an S type, growing "as a perfectly regular hemisphere with a smooth and waxy surface," while numerous intermediate forms were met with, which did not become fixed in their characters. The conversion of S into R types and *vice versa* is described and discussed, and the following are the author's conclusions.

"1. It has been shown that many cultures of *Mycob. leprae* contain two or more colony types. In a group of fourteen cultures, regarded as belonging to the species, part were found to contain only S colony types, part only R types and part, mixtures of the two together with intermediate forms.

"2. Both types have been shown to exhibit a considerable degree of stability on most solid media while both have dissociated in certain culture fluids.

"3. S to R dissociation has occurred quite regularly on a variety of fluid media.

"4. The R types under all conditions studied have appeared much more stable than the S, yet a sufficient number of instances have been recorded definitely to demonstrate R to S dissociation.

"5. The S and R types were also shown to be distinguishable on the basis of growth habit in fluid media and oxidation-reduction potential growth curves, by acid agglutination, by electrophoretic potential and isoelectric points of suspensions and by antigenic content.

"6. Antigenic analysis by quantitative complement fixation and agglutination-adsorption reactions have indicated that the S organisms possess a specific S antigenic substance which is lacking in the R organisms."

L. R.

MRYOSHI (Shukuji). **The Complement-Fixation Reaction of the Leprous Serum. (IInd Report.)**—*Japanese Jl. Dermat. & Syph.* 1933. June. Vol. 33. No. 6. [In Japanese pp. 964-981. [47 refs.] English summary pp. 106-109.]

The author reports on the complement-fixation reaction with the use of "ovolecithin" combined with the alcoholic extract of human nerve as antigen in 332 lepers with 53.6 per cent. positive and 46.4 per cent. negative. L. R.

KORNEL (G.). Vergleichende Komplementbindungsversuche mit Seren von Leprösen, Tuberkulösen und Luetikern. [**Comparative Complement Fixation Tests with Sera from Cases of Leprosy, Tuberculosis and Syphilis.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1933. Vol. 78. No. 3/4. pp 207-216. [15 refs.] [Summary appears also in *Bulletin of Hygiene*]

The author tested the sera of 14 cases of leprosy, 2 of suspected leprosy, 3 with no sign of leprosy but with leper relatives, 10 of tuberculosis and 10 of syphilis for complement-fixation with the Witebsky-Klingenstein-Kahn Tb. antigen, with extracts commonly employed in the Wassermann test and with an extract of leproma made by himself. The leproma antigen was made from fresh bits of leproma which were rubbed up to a pulp and mixed with equal parts of physiological saline and 4 per cent. NaOH. The mixture was allowed to stand for an hour at 37°C. and the deposit of this was then washed with distilled water, neutralized with 4 per cent. HCl and dried at 57°C. The dry powder was mixed with sulphuric ether (1 cc. to 0.01 gm. powder) in which it stood for 4 days after which the ether was poured off and the residue, after being dried, was extracted with 96 per cent. alcohol for 16 days at 37°C. The resulting extract was filtered and the filtrate used in the test in a dilution of 1 in 5. With one exception all the leprosy sera gave positive complement-fixation reactions with all the antigens but were doubtful or negative to the Sachs-Georgi test. One of the suspected leprosy cases was positive and the other doubtful with the Tb antigen. Both gave doubtful reactions with leproma antigen and were negative to the Wassermann test. Of the three symptomless relatives of lepers, one gave negative or doubtful reactions throughout, the other two were positive only with the leproma antigen. Of the 10 tuberculosis cases only one gave a positive reaction with leproma antigen while 6 were positive with Tb, and all were negative or doubtful with the Wassermann. Of the syphilis cases half were positive with the leproma antigen.

Thus as a means of distinguishing Tb. from leprosy the Tb. antigen failed while the leproma antigen was relatively successful as it gave only one definitely positive result with Tb. sera. For the exclusion of syphilis in cases of leprosy the Sachs-Georgi reaction appears to have been the most successful. The author hopes from the results with relatives of lepers with whom they had been in close contact that further work may show the leproma antigen to be a valuable means of detecting leprosy in leper contacts before clinical signs have appeared.

L. W. Harrison.

AMBROGIO (Agostino). Alcune osservazioni cliniche e sperimentali sui fenomeni allergici nell'infezione lebbrosa. [*Allergy in Leprosy.*]—*Pathologica*. 1933. July 15. Vol. 25. No. 501. pp. 514-531. With 2 coloured figs. on 1 plate. [96 refs.] English summary.

The author's observations were made on twelve lepers. For specific antigens he used a watery alcoholic extract of a leproma and an emulsion of the bacillary and protoplasmic substances resulting from trituration of a nodule. For non-specific antigens, tuberculin 25 per cent. and undiluted for the cutireaction, and 0.5 cc. of a 10 per cent. solution for intracutaneous use, and gonococcus vaccine from 100 to 1,000 millions per cc.

The cutireaction with 25 per cent. tuberculin was negative in all, with the undiluted product he observed an erythema in 3 of the 12, coming on in about 36 hours and passing off in 72. Controls were all negative. The intracutaneous injection brought a good and prompt response (within 24 hours) in 3 patients with the anaesthetic type, and in a fourth, with mixed leprosy, the reaction was slower to develop (48 hours). Those who reacted well to tuberculin gave a strong reaction also with gonococcus vaccine. [This would appear as if the reaction was one merely to foreign protein in the susceptible; no statement is made as to whether there might be a latent gonococcal infection in any of these subjects.]

The specific antigens were applied by scarification and by intradermal injection. The alcoholic extract produced a slight erythema, disappearing in 36 hours, in one patient only, suffering from anaesthetic leprosy. The intradermal test with 0.05 cc. of a 1 per cent. dilution yielded a positive result in all, more marked in the anaesthetic or mixed forms, and varying from a local erythema with slight infiltration disappearing in 4-5 days, to a small red nodule with haemorrhage and a zone of erythema, paling in 48 hours but the nodule did not disappear for about a week. The article is well documented. H. H. S.

HAYASHI (Fumio). Mitsuda's Skin Reaction in Leprosy. *Internat. J. Leprosy* Manila. 1933. Jan. Vol. 1. No. 1. pp. 31-38. With 2 figs. & 2 plates.

In 1916 MITSUDA first reported that the intradermal injection of boiled emulsions of lepra-bacilli-containing-nodules produced positive reactions in neuro-macular, but negative ones in nodular leprosy. Similar tests on 192 cases are now reported with the use of fresh nodules boiled in normal salt solution for 30-50 minutes, ground in a mortar, 1 gram added to 20 cc. of the salt solution, filtered through gauze, heated to 60°C. for one hour and enough carbolic acid added to make a 0.5 per cent. concentration. One-tenth of a cc. is injected intracutaneously and the reaction looked for on the 8th, 16th and 24th days in the form of infiltrated areas from 0.3 up to over 1 centimetre in diameter and classed from + to +++ by their extent. Of 64 neuro-macular all but 2 were positive, while all but 11 of the 125 nodular ones were negative. Thus a positive reaction occurs only in normal people resistant to leprosy and in the partially resistant neuro-macular stage. It is also of some prognostic value, for a case of nerve leprosy with a negative reaction is likely to pass into the nodular type, and a positive reaction in a nodular case is a favourable

prognostic sign. Other acid-fast bacilli, such as Timothy hay, and those of Clegg, McCoy, Duval and Kedrowsky, have positive reactions with all types of leprosy, so they differ from that of human leprosy.

L. R.

GUILLINY (R.) & MONTASTRUC (E.). Etude sur la lèpre oculaire murine. [**Ocular Rat Leprosy.**—*Bull. Soc. Path. Exot.* 1933. July 12. Vol. 26. No. 7. pp. 901-905.

In eight rats inoculated intraperitoneally with rat leprosy the eyes were examined microscopically and in one a slight infection of the ciliary body and in another of the conjunctiva was found. Rats were therefore inoculated into the anterior chamber of the eye with very small numbers of rat leprosy bacilli from infected glands, and subsequent microscopical examinations showed that the organisms became localized in the ciliary bodies in large cells within which they multiplied rapidly.

L. R.

BALIÑA (Pedro L.). Obstáculos que traban la implantación de la lucha anti-leprosa en nuestro país.—*Prensa Méd. Argentina.* 1933. July 5. Vol. 20 No. 27 pp. 1453-1473 With 26 figs

COLVIN (Clifford), PATON (J. T.) & DAWES (S. R.). Leproma of the Cornea.—*Med. Jl. Australia* 1933 June 3 20th Year Vol. 1 No 22 pp 685-686

DA JUSTA (Antonio Alfredo). A lepra no Estado do Ceará. (Notas e Informações)—*Rev. Med-Cirurg do Brasil* 1933. June Vol 41. No 6. pp. 172-196

KNAP (C. Reeling). De leproserie te Tobemba in Zuid-Palopo—*Geneesk. Tijdschr v Nederl.-Indië.* 1933. July 4 Vol. 73 No 14. pp. 866-870

RABELLO (Eduardo). Segregação e isolamento na prophylaxia da lepra —*Folha Med* 1933 May 5. Vol 14. No 13 pp. 254-265. With 1 chart.

REKO (Victor A.). Volkstümliche Heilmittel bei Lepra in Mexiko —*Tuberkulose.* 1932 Vol. 12. No 1. pp 15-18.

ROXBURGH (A. C.). Leprosy (Mixed Type).—*Proc Roy. Soc Med* 1933 Aug. Vol 26. No 10 pp. 1302-1303 (Sect. of Dermat. pp. 62-63).

TROPICAL OPHTHALMOLOGY.

A REVIEW OF RECENT ARTICLES. XX.*

Trachoma.—BARRAL & LUC¹ usually treat their trachoma patients by placing them in a sufficiently favourable environment to enable them to resist secondary infections and by using instillations of zinc and copper sulphate. Copper sulphate stick is applied twice weekly. They remark, however, that their more severely affected patients are not always rendered fit for service, and they have consequently given a trial to Jacobson's method of injecting intramuscularly a solution of Ethyl Cinnamate in benzyl alcohol and olive oil. They speak very favourably of this treatment. ROQUES² advocates grattage with a lump of sugar. The rubbing is sufficient to cause free bleeding from the membrane, and the block of sugar is allowed to absorb the blood. Treatment is repeated every few days. GUY & TRAN-VAN-NGUU³ have tried applications of oil of chenopodium. The oil is rubbed into the trachomatous conjunctiva with a tampon of wool, and sufficient force is used to induce a flow of blood. MOTAIS⁴ has described some of his experiences in treating the disease in Cochin China. He adopts MacCallan's classification of trachoma with some modifications. It is interesting to observe that with increasing experience his methods of treatment have tended to become less radical. Thus he considers silver nitrate in a solution stronger than 1 per cent. to be dangerous, and he has abandoned the routine use of copper sulphate crystals and severe scarifications. Instead he has adopted scrubblings with a wool mop carrying a solution of copper sulphate one in twenty. For corneal complications he favours subconjunctival injections of 1-3,000 cyanide of mercury. He uses 1 cc. of the solution mixed with 4 per cent. novocaine. CORNET⁵ has attempted a fresh classification of trachoma. The utility of such a classification is in inverse ratio to its length and complexity and this particular one occupies eight pages. HAE⁶ slits the trachoma follicles with a Graefe knife and then, with wool mounted on a glass rod, rubs boracic acid powder into the membrane. The conjunctival sac is next washed out with cold water and an ointment of yellow oxide of mercury with ephedrine is applied. The treatment is said to be painless and the patient can resume work in a few minutes. THYGESON⁷ has reported the successful inoculation

* For the nineteenth of this series see Vol. 30, pp. 374-381.

¹ BARRAL (R. E. L.) & LUC (R. H. L.). Résultats obtenus par la méthode du docteur Jacobson dans le trachome.—*Arch. Méd. et Pharm. Milit.* 1933. Feb. Vol. 98. No. 2. pp. 164-169.

² ROQUES (Henry). Nouveau traitement mécanique du trachome.—*Gaz. hebdom. Sci. Méd. de Bordeaux* 1933. Jan. 22. Vol. 54. No. 4. pp. 58-59.

³ GUY (R.) & TRAN-VAN-NGUU. Note sur un traitement du trachome par les brossages à l'huile de chenopodium.—*Bull. Soc. Méd.-Chirurg. Indochine*. 1933. Mar-Apr. Vol. 11. No. 2. pp. 115-117.

⁴ MOTAIS. Du traitement contre le trachome pratiqué actuellement à la clinique ophtalmologique de Cochinchine.—*Bull. Soc. Méd.-Chirurg. Indochine*. 1933. Mar-Apr. Vol. 11. No. 2. pp. 118-126. With 1 fig.

⁵ CORNET (Emmanuel). Le trachome en clinique et sa classification nouvelle.—*Bull. Soc. Méd.-Chirurg. Indochine*. 1933. Mar-Apr. Vol. 11. No. 2. pp. 165-178. [30 refs.]

⁶ HAE (Lim Eng). Treatment of Trachoma in Private Practice.—*Malayan Med. J.* 1933. June. Vol. 8. No. 2. pp. 102-105. With 4 diagrams.

⁷ THYGESON (Phillips). Inoculation of the Human Conjunctiva with Trachomatous Materials.—*Amer. J. Ophthalm.* 1933. May. Ser. 3. Vol. 18. No. 5. pp. 409-411.

of a man with trachomatous material. The subject had been inoculated with the *Bacterium granulosis* on several occasions without any result. Acute symptoms developed after six days; and in twenty-six days the other eye became affected. Some minute non-pathogenic bacteria were recovered from the eye. These resembled the *Bacterium granulosis*, but were probably saprophytes derived originally from the air.

In the *Revue Internationale du Trachome* for April 1933 (Tenth Year No. 2) Archimede BUSACCA⁸ discussing 100 cases of trachoma claims that some form of pannus could be detected in 99 per cent. of the patients. He describes a non-vascularized stage of trachomatous keratitis and considers that this always precedes the formation of new vessels. He is of opinion that trachomatous nodules and Herbert's "fossettes" do not occur in the true cornea, but only in that portion of the membrane which is covered by an extension of the conjunctiva. M. ZACHERT⁹ presents the problem of Poland in relation to the disease. The eastern boundaries of this nation are in contact with extremely trachomatous countries: Soviet Russia, Lithuania and Roumania. Poland therefore serves as a barrier preventing the spread of the disease to the countries of Western Europe, and, thanks to the excellence of her sanitary precautions, she has kept the incidence low within her own borders. E. DELANOË¹⁰ defends the use of chaulmoogra oil in the treatment of trachoma against the statement of PAGÉS (referred to in this *Bulletin*, Vol. 30, No. 6, p. 374) that no specific action can be claimed for the drug. She quotes the observations of various surgeons in her support and seems to imply that the drug may not have been applied with sufficient energy in unsuccessful cases. Chaulmoogra oil undoubtedly has the advantage that it is less irritating to the conjunctiva than the caustic drugs so often used. J. JACOBSON¹¹ reports the findings of a commission appointed to test the value of his treatment of trachoma by the injection of benzyl-cinnamic ester. 357 trachoma patients were treated by intra-muscular injection of the drug, local applications, with the exception of atropine when necessary, being discontinued, and 175 of the patients showed marked improvement. An increased resilience of the upper tarsal plate was specially notable and corneal troubles were much ameliorated. The drug causes a healthy dilatation of the bloodvessels and leads temporarily to an increased flow of tears. E. JUNÈS¹² refers to his experience of the same treatment in Sfax. This has been most favourable. In the issue for July 1933 MORAX (pp. 113-129) pleads for the recognition

⁸ BUSACCA (Archimede) La frequenza delle complicazioni corneali nel tracoma dedotta dallo esame di cento casi.—*Rev. Internat. du Trachome*. 1933. Apr. Vol. 10 No. 2. pp. 57-81. English summary

⁹ ZACHERT (M) Le problème du trachome en Pologne en comparaison avec les pays avoisinants.—*Rev. Internat. du Trachome*. 1933. Apr. Vol. 10. No. 2. pp. 82-86. With 1 fig.

¹⁰ DELANOË (E) A propos d'une enquête sur le traitement des trachomateux à toutes les périodes de l'évolution de leur maladie à l'aide de l'huile de chaulmoogra.—*Rev. Internat. du Trachome*. 1933. Apr. Vol. 10 No. 2. pp. 87-99

¹¹ JACOBSON (J) Résultats obtenus dans le traitement du trachome au cours de notre mission en Tunisie avec la solution d'éther benzylcinnamique, dite "solution de Jacobson" (25 décembre 1931-15 mai 1932).—*Rev. Internat. du Trachome* 1933. Apr. Vol. 10. No. 2. pp. 100-107.

¹² JUNÈS (E.) A propos du traitement des lésions cornéennes du trachome par la solution de Jacobson.—*Rev. Internat. du Trachome*. 1933. Apr. Vol. 10. No. 2. pp. 107-109.

of the importance of cell inclusions in trachoma. Philippe THYGESON¹³ reviews the work done with respect to the bacteriology of the disease and concludes that, though it may be tempting to regard trachoma as non-specific and merely the result of repeated infections by various different varieties of bacteria, yet a microbic cause is probable and this is likely to belong to the filterable virus group. Patrick DIXON¹⁴ states that he has found more than 10 per cent. of the population of the Kasenga district in the Belgian Congo affected by trachoma. SEDAN¹⁵ records his experience of Tricoire's reaction as an aid to diagnosis. About 77 per cent. of the trachoma patients whom he examined reacted, and he considers that further developments of the test may render it really valuable.

Xerophthalmia and *Keratomalacia* continue to attract increasing attention. This is very advantageous since the condition is not only responsible for much blindness and incapacity, but its occurrence also indicates a serious defect in the nutrition of the population of the districts in which it is encountered. GORDON¹⁶ found 14 inmates of the Mathari Mental Hospital affected and had their skin lesions examined by Dr. J. H. SEQUEIRA and the bacteriological condition of their eyes by Dr. DE SMIDT. Small papules, bluntly conical in shape, were seen at the orifices of the hair-follicles; and it is suggested that these resulted from an extraneous infection which was favoured by a lowered resistance of the skin due to vitamin deficiency. Diphtheroid bacilli were found in the conjunctival sac of every case; but these gave a negative result on animal inoculation. All the patients improved under cod-liver oil treatment. A ration of spinach has now been included in the diet of the inmates and arrangements have been made for a full supply of sweet potatoes. OWEN¹⁷ writes regarding the disease in the Kampala district. There xerophthalmia is practically confined to the inmates of prisons. The majority of the free population live on a diet which consists basically of plantains and sweet potatoes supplemented by various vegetables, fruits and nuts in small quantity. Eggs, meat, milk, butter and ghee are seldom, if ever, consumed. The jail diet consists of maize, dry beans, ground nuts, and a small amount of meat supplemented by a comparatively small quantity of sweet potatoes. The author states that if xerophthalmia occurs even mildly and infrequently in a prison all the inmates are on the border line and a damaged liver may be the factor which determines the occurrence of the disease. He suggests that a thorough knowledge of xerophthalmia is essential for any medical officer who is responsible for the

¹³ THYGESON (Philippe). L'étiologie microbiologique du trachome.—*Rev. Internat. du Trachome* 1933. July. Vol. 10. No. 3. pp. 129-142.

¹⁴ DIXON (Patrick K.). Un foyer du trachome jusqu'ici non-rapporté. *Rev. Internat. du Trachome* 1933. July. Vol. 10. No. 3. pp. 142-145. With 1 map in text.

¹⁵ SEDAN (Jean). Résultats de cent cinquante intradermo-réactions de tricoire dans le trachome.—*Rev. Internat. du Trachome*. 1933. July. Vol. 10. No. 3. pp. 145-154.

¹⁶ GORDON (H. L.). Xerophthalmia in Mathari Mental Hospital.—*East African Med. J.* 1933. June. Vol. 10. No. 3. pp. 85-90.

¹⁷ OWEN (H. B.). Observations on Health in Relation to Diet in I.M. Central Prison, Uganda. The Ocular Manifestations of Vitamin A Deficiency.—*East African Med. J.* 1933. May. Vol. 10. No. 2. pp. 53-58.

health of a rationed community since vitamin A is also called anti-infective vitamin. CORNET¹⁸ has had experience of the disease in Cochin-China and has described its clinical characteristics. He recognizes that the corneal changes in keratomalacia usually are first seen in the substantia propria—a point often insufficiently appreciated. He recommends the use of subconjunctival milk injections, instillations of olive oil, and suitable diet. [The value of any subconjunctival injection in this disease is very questionable. The essential principles of treatment are to treat any gastro-intestinal defect and at the same time to ensure the absorption of cod-liver oil. If this absorption takes place an associated improvement in the general condition will occur. Locally, all irritation of the corneal and conjunctival surfaces should be avoided, and the conjunctival sac should be kept clean and lubricated by the use of normal saline and liquid paraffin. Owing to its high lysozyme content, albumen water, made by dissolving the white of a fresh egg in normal saline, might prove useful.]

Superficial Punctate Keratitis.—SARADINDU SANYAL¹⁹ has described an epidemic of superficial keratitis which occurred in Calcutta during the monsoon. It differed in some respects from the epidemics observed in Madras and elsewhere. 175 cases were seen and a noteworthy feature was the way in which members of the same family and room mates of the same hostel tended to be attacked. Punctate and linear forms were met with and in some cases an annular band of fine opacities started at the periphery of the cornea and spread towards the centre. Some conjunctival reaction was noticed, but iritis did not occur. Recovery usually occurred within a week or ten days, but was sometimes delayed for about three weeks.

KIRWAN²⁰ considers that the incidence of *cataract* in diabetes is greater than in non-diabetics of the same age and that, as a result of diabetes, the cataractous lens changes appear at a relatively early age and tend to mature more rapidly. He reports four cases in which cataract occurred under the age of thirty in diabetics and was undoubtedly caused by the systemic disease. Three of these were operated upon successfully after the urine had been rendered sugar-free by treatment but the fourth died from acute miliary tuberculosis before operation. The blood sugar should be brought to normal or to near normal before operating on a diabetic for senile cataract, and it is advisable to wash out all cortical matter and then to perform a small button-hole iridectomy in such a case in order to lessen the risk of haemorrhage into the chamber and the formation of a dense after cataract.

HAE²¹ has described a treatment for *couched lens* which has given him satisfaction. The pupil of the patient is fully dilated and he is then placed in the prone position until the lens nucleus falls into the anterior chamber. When it has reached this position the pupil is rapidly contracted by instilling amino-glaucon in order to prevent

¹⁸ CORNET (Emmanuel). Le xérosis en clinique oculaire. Son nouveau traitement local (facteur A liposoluble).—*Bull. Soc. Méd.-Chirurg. Indochine*. 1933. Mar-Apr Vol. 11 No. 2. pp 179-189. [42 refs.]

¹⁹ SANYAL (Saradindu). Epidemic Superficial Keratitis.—*Amer. J. Ophthalm.* 1933 May. Ser. 3. Vol. 16. No. 5 pp 390-393

²⁰ KIRWAN (E. O'G.). Diabetic Cataract.—*Brit. J. Ophthalm.* 1933. June. Vol. 17. No. 6. pp. 346-351. With 3 figs.

²¹ HAE (Lim Eng). Treatment of Couched Lens.—*Malayan Med. J.* 1933. June. Vol. 8. No. 2. pp. 105-108. With 3 figs.

any return to the vitreous and the lens is then extracted. The treatment should be undertaken before any severe iridocyclitis has set in. [The reviewer was accustomed to treat these cases by removing the lens with a spoon, and found it surprisingly easy to effect this without any loss of vitreous. The vitreous appeared to have acquired an increased consistency; and the aqueous, too, seemed to have increased in volume. His results were sufficiently good to encourage him to continue this practice.]

The variations in intra-ocular pressure which occur amongst opium addicts has been investigated by Kanji KANDA and Kazen So²². Twenty-two persons were dealt with and the authors found their ocular tension to be either normal or somewhat higher than normal despite the contracted pupils displayed by the majority. The general condition of an addict is unstable and this is responsible for irregular variations in his intra-ocular pressure.

Beriberi — AYUYAO²³ has met with a corneal lesion in recently confined women who are suffering from beriberi. The patients complained of blurred vision affecting both eyes but were free from pain or discomfort. The conjunctiva, anterior chamber, iris and lens appeared normal whilst the pupil reflexes were unaffected. The fundus reflex was uneven, and only a distorted image of the fundus could be obtained. The author states that he found amyloid changes in the corneal epithelium and that this was the cause of the symptoms. Slow recovery occurred as the general disease got better.

²⁴The Annual Report of the Ophthalmic Section of the Egyptian Government for the year 1931 deals with the large number of 634,088 new admissions to the Eye Clinics of the country and thus furnishes very valuable statistics regarding the incidence of diseases of the eye. The acute ophthalmias constitute the chief cause of blindness (80 per cent.) and the gonococcus is the predominant infecting organism (45 per cent.) School Clinics are an important item in the activities of the department. Over 11,000 pupils were examined during the year and of these 96 per cent. were found to be suffering from trachoma. This very high rate of infection discovered is ascribed to the fact that a magnifier (? Zeiss loupe) was employed for the examination of the children and follicles were therefore detected which would have escaped observation by the naked eye. Over 73,000 operations for trichiasis, 2,600 for dacryocystitis (excision of sac), 1,600 for senile cataract, and 1,000 for glaucoma (trephining) were performed. The Report contains illustrations of the many hospitals and units of the department.

H. Kirkpatrick.

²² KANDA (Kanji) & So (Kazen). Clinical Observations on the Intra-ocular Tension of Opium Habitues in Formosa.—*Brit Jl Ophthalm.* 1933. June. Vol. 17 No. 6 pp. 354-360.

²³ AYUYAO (Conrado D.) Corneal Lesion in Beriberi.—*Jl. Philippine Islands Med. Assoc* 1933. Mar Vol 13. No. 3. pp. 158-161.

²⁴ EGYPT: Ministry of the Interior. Department of Public Health. Ophthalmic Section. Nineteenth Annual Report for the Ophthalmic Section, 1931.—40 pp. With 39 figs. on 18 plates, 1 folding map & 1 folding chart. 1933. Cairo. [P.T. 10.]

BERIBERI AND EPIDEMIC DROPSY.

VAN VEEN (A. G.). De invloed van wasschen en stoomen op het B₁-vitaminegehalte van rijstsoorten van verschillende slijpgraad. [**B₁-Vitamin Content remaining in Rice of Different Degrees of Polish after Washing and Steaming.**]—*Geneesk. Tijdschr. v. Nederl. Indië*. 1933. July 18. Vol. 73. No. 15. pp. 945-957.

The degree to which rice has been polished is generally, but wrongly, regarded as the sole factor determining the onset of beriberi by avitaminosis. It is a misconception also to locate the vitamin in the cuticle, for it is contained in the layer below this and in the germ. The various tests applied to rice, the iodine test, the phosphorus pentoxide test, etc., are not wholly satisfactory. Feeding tests take too long. In the author's opinion the tests applied are often of little value because they take no account of the importance for vitamin content of the mode of preparation of the rice for food. Two main methods of preparation are in use, (1) washing and steaming, and (2) cooking with water and evaporating or straining; these, in their several variations, have been investigated as regards the vitamin left in the rice. Supposing that a man absorbs all the vitamin ingested, which is sometimes doubtful, that he eats 500 gm. rice per day and that 0.5 to 1 mgm. of crystalline B₁ vitamin (125 to 250 International Standard Units) is his daily requirement, we may determine from these data what is the effect of preparation on the anti-beriberi qualities of rice. Various types of rice were tested and especially in ascending degrees of "polish"—silver-cuticle rice, slightly polished and hand milled rice, and highly polished rice. In Java the washing process, which is vigorous, is short, about 10 minutes, until the wash-water is clear. The results obtained by the author for samples of slightly polished rice, subjected to the processes of no treatment, washing, steaming, washing and steaming, soaking and steaming, soaking, washing and steaming, boiling and evaporating, and long washing were respectively in international units, 250-400, 125-200, 250-400, 75-125, 200-250, 125-200, 250-400 and much less than 100. Thus washing in particular is to be avoided. A special recommendation is made of the procedure known as "Parboiling."

W. F. Harvey.

AALSMEER (W. C.) & BIE (Gan Sing). Rijst en beri-beri. De pitressinreactie. [**Rice and Beriberi. The Pitressin Reaction.**]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1933. Mar. 28 Vol. 73. No. 7. pp. 408-419.

The great majority of beriberi patients with active disease react promptly to vitamin B in whatsoever form it is administered but there are some exceptions. The possibility of an unfavourable effect of one of the food components suggested itself as an explanation for these exceptions. A patient placed on a vitamin-rich diet may be, to all appearance, cured and yet the adrenalin test (this *Bulletin*, Vol. 29, p. 92), is just as positive (lowering of the minimal blood pressure) as it was originally. We know that beriberi can develop in spite of full vitamin dietary owing to selective or total disturbance of absorption and assimilation. Might it not be possible that the food itself contributed to the prevention of the action of the vitamin? That a toxic substance in the rice could be the cause of delay in cure was very improbable as the majority of patients treated were rapidly cured with exactly the

same diet. It was decided then to leave red rice out of the dietary and it is difficult to avoid the impression that the withdrawal of this rice was the cause of the satisfactory effect produced upon the symptoms. The adrenalin reaction became favourably influenced.

With resistant secondary cases of beriberi the possibility was considered whether the pitressin reaction would bring relief. Pitressin, however, which was introduced as a medicament in the treatment of beriberi because it appeared to cause immediate disappearance of the whole vascular syndrome, failed repeatedly to fulfil this expectation. This failure of the pitressin effect was directly correlated with the failure of dietetic cure. The relief of the right heart threw a correspondingly great burden on the left heart, to which it was not equal in those patients who had not yet recovered. One of the patients indeed, with "shoshun" died immediately after the pitressin injection. The failure to benefit from pitressin in cases of beriberi, where the adrenalin reaction still remains positive even though few symptoms of the disease may be present, can be taken as an indication that the disease is still active.

W. F. Harvey.

MASSIAS (C.). Le traitement du bérubéri par une préparation contenant vitamine B et acides aminés. [**Treatment of Beriberi by Vitamin B and Amino Acids.**].—*Bull. Soc. Path. Exot.* 1933. June 14. Vol. 26, No. 6. pp. 789-792. [Refs. in footnotes.]

Working in Cochin China the author reports good results in beriberi from the use of a preparation containing brewer's yeast and amino acids.

The Annamites in Cochin China live almost exclusively on rice, fish and a fish sauce called Nuoc-mam. Beriberi is common. In 1930 the author began treatment of the disease with tablets (4 per day) containing brewer's yeast and amino acids. In January 1933 the same preparation was given in the form of a paste (a "cuiller à soupe" per day). The results have been very satisfactory. Within a few days acute cases with cardiac symptoms are relieved while oedema is improved in 2-4 weeks. In about 2 months the more chronic cases are able to walk normally. In 1930 there were 275 cases of beriberi with 25 deaths. Treatment was begun in 1931 and in that year there were 322 cases with 23 deaths. In 1932 out of 274 cases there were only 8 deaths.

A. D. Bigland.

CALCUTTA MEDICAL JOURNAL. 1933, Feb. Vol. 27, No. 8. pp. 271-291. With 14 charts.—**Discussion on the Epidemiology and Public Health Aspects of Epidemic Dropsy.**

ROY (B. C.), NANDI (P.) & GHOSH (J. L.). **Report of Cases of Epidemic Dropsy treated in the Carmichael Medical College Hospitals (with a Note on Treatment).**—*Calcutta Med. Jl.* 1933, Feb. Vol. 27, No. 8. pp. 292-317.

The discussion was opened by Dr. T. N. MAZUMDAR. Epidemic dropsy first appeared in Calcutta in 1877 and two following years. With the exception of a small outbreak in 1901 no further cases were reported till 1907, when an epidemic occurred in which peripheral neuritis and oedema were the characteristic features, 15 deaths out of 300 cases were recorded. In 1909 there were 433 deaths from the disease, the death rate being 0.5 per 1,000. Among the Hindus the fatal cases numbered 336, while among the Mahomedans there were only

77. The epidemic of 1919 occurred during the second half of the year ; 96 deaths were recorded, the death rate being three times greater among the Hindus as compared with the Mahomedans and four times greater in females. Further epidemics were noted in 1926 and 1927, the fatal cases numbering 939 and 630 in the respective years. In 1930 there were 68 deaths and in 1931, 52

The onset of the disease is always during the rainy season and it seems that damp houses and a humid atmosphere may be important etiological factors. Heavy rainfall, however, is not always associated with epidemic dropsy outbreaks. Decomposition of rice due to humidity, pressure and poor ventilation with the consequent production of poisonous amines, is another possible factor. Atap rice is more liable to decomposition and has a much lower vitamin content than polished or siddha rice. Biochemical investigations of the blood show that uric acid is increased, calcium decreased, while other constituents are within normal limits. In the discussion which followed, the presence of peripheral neuritis in the 1907 epidemic was remarked, and mention was made of the fact that in other epidemics neuritis was absent

(2) A report upon 22 cases of epidemic dropsy treated in the Carmichael Medical College Hospitals.

The staple diet of these cases was rice, but no evidence was found pointing to the harmfulness of any particular brand. Nineteen cases were in Hindus, while the sex incidence was 12 : 10 in favour of males. The age period 20-30 years showed the highest susceptibility. Examination of blood showed marked anaemia with leucocytosis, and uric acid was generally increased. Bacteriological investigations of urine and stools gave negative results but the gastric contents showed achlorhydria. Treatment consisted chiefly of diet adjustment, particularly as regards vitamins, and the exhibition of digitalis and strophanthin to patients showing cardiac involvement. Blood letting was very successful in severe cases. Three of the cases ended fatally.

A. D. B.

SARKAR (Sarasi Lal) & GUPTA (B. M.). **Rice Infection and Epidemic Dropsy.**—*Indian Med. Gaz.* 1933. June. Vol. 68. No. 6. pp. 324-325.

An account of a small outbreak of epidemic dropsy which was due to the eating of a particular sample of rice, the storage of which had been faulty.

The outbreak occurred in a single household at Raipur, a populous village in the district of Noakhali. A particular boat-load of rice arrived at the village and was sold to various people, none of whom developed the disease except members of the household of a certain Dr. Nath. In this family the rice had been stored in a dol besmeared with cow dung outside and kept in a damp room. After about 7 months (when the last portion of the rice at the bottom of the dol was being consumed) all the members of the household, including the doctor himself, developed epidemic dropsy and there was one death. It seems probable that a saprophytic organism in the rice had become pathogenic during long storage in the presence of damp. The same rice stored in earthen vessels previously soaked in mustard oil was harmless.

A. D. B.

PELLAGRA.

CHICK (Harriette). **Current Theories of the Aetiology of Pellagra.**—*Lancet*. 1933. Aug. 12 pp 341-346 [47 refs]

The main etiological possibilities of the nutritional aspect of pellagra are reviewed. The amino acid deficiency theory, the vitamin deficiency theory and the maize toxic theory are very fully discussed. Another possibility is presented, viz., "pellagra is caused by a toxic substance derived from the maize diet, which can be corrected by sufficient 'good' protein, or perhaps by sufficient vitamin B₂ (which is found to accompany the 'good' proteins)"

The new possibility of pellagra being a dietetic disease due to a positive toxic agent combined with vitamin deficiency has many analogies —(1) EIJKMAN held that the substance in rice polishings which prevented and cured polyneuritis in birds acted as an antidote to the poison produced in the animal as the result of a polished rice diet. (2) MELLANBY has shown that "toxamins" from cereals having a harmful effect on bone calcification can be neutralized by vitamin D. Also a cereal-free diet is helpful in checking the spread of dental caries in children. (3) MELLANBY has also found that the toxic effect of ergot can be counteracted by substances such as butter and mammalian liver oil rich in vitamin A. Epidemic ergotism and lathyrism may have a similar etiology. (4) Boas FRXSEN has described skin lesions and loss of fur in young growing rats fed on diets in which dried egg white is the sole source of protein. This pathological condition can be prevented or cured by giving diets containing small amounts of yeast and liver.

This theory, too, explains why severe alcoholics in the U.S.A. are so liable to develop pellagra, since the whisky is made from maize products and the poor consumption of food which accompanies hard drinking will explain the inability of the patient to neutralize the poison. Alcoholic pellagra is rare in those European countries in which none of the strong liquors is derived from maize.

"The suggestion put forward that pellagra may be caused by a toxin derived from the diet, which can be corrected in the presence of certain foodstuffs (such as meat, milk, eggs, green vegetables) if given in sufficient quantity is, at present, a speculation." It is certainly a good working hypothesis.

A. D. Bigland.

THAYSEN (Th. E. Hess). **Pellagra.**—*Hospitalstidende*. 1933. Mar. 30. Vol. 76. No. 13. pp. 325-348. With 25 figs. (21 on 11 plates). [28 refs.]

A detailed account of four cases of pellagra in Denmark is prefaced by a survey of the history and literature of this disease.

With regard to the diagnosis, it is admitted that the characteristic dermatitis may, according to certain authorities, be absent in otherwise typical cases. But Hess Thaysen advises his compatriots to regard pellagra dermatitis as an essential to the diagnosis of pellagra in Denmark. In all four cases there had been some previous illness, a psychosis in one case and some disease of the digestive tract in the other three. It was noteworthy in one case, that of a woman aged 48, that her diet had always been the mixed diet on which most Danes live, with this

exception that she had not taken milk. Cases such as this, and they seem not to be rare, would at first sight suggest that pellagra cannot be simply a vitamin-deficiency disease. But Hess Thaysen considers the conception of pellagra as a vitamin-deficiency disease is secure against the criticism which such cases evoke, and he puts forward various explanations for the development of pellagra in patients living on a so-called anti-pellagra diet. One explanation is that disease of the digestive tract may prevent the absorption of substances the lack of which is responsible for pellagra. Thus, in one of his patients, in whom violent diarrhoea was persistent, a dietary including plenty of meat, eggs, green vegetables, yeast and dried liver failed to have any effect on the pellagra as long as the diarrhoea lasted. When it ceased, and the same dietary was continued, the pellagra disappeared. Hess Thaysen advises his colleagues to be on the look out for pellagra, particularly among the insane and among patients with digestive disturbances and chronic infections. As for the insane who refuse to eat, the not uncommon practice of feeding them on such slops as oatmeal gruel which are deficient in vitamin B₂ may be asking for trouble. The dietary in such cases should contain vitamin B₂ in the form of milk and meat or yeast, as well as the other vitamins. C. Lillingston.

STOCKMAN (Ralph) & JOHNSTON (J. M.) **Cereal Food Poisoning and its Relation to the Etiology of Pellagra.**—*Jl. Hygiene*. 1933 Apr. Vol. 33. No. 2. pp 204–223 With 18 figs on 3 plates. [19 refs.]

“A maize diet can cause in monkeys characteristic nervous symptoms and death, and pathological changes in the nervous system identical with those found in pellagra.” The harmful constituent of the grain is an acid which was isolated and given experimentally to various animals.

It was found that maize contains an acid which when administered by the stomach or hypodermically as a sodium salt produced in monkeys the same harmful effects as the maize itself. Rabbits and guineapigs are also susceptible. Similar results were obtained with other cereals (rice, rye, wheat and oats). There was no question of deficiency in vitamins as the animals received abundant vitamin-containing food. The effect is a direct toxic one, since the more cereal food or acid extractive given the severer are the symptoms. The poison probably injured the nervous and other systems both directly and by disturbing the calcium and alkali balance in the body. “Our monkeys and rabbits produced, probably as nearly as can be reproduced in animals, the symptoms and lesions of pellagra, and the pathological findings in the nervous system were identical with those described by numerous investigators as occurring in pellagra. The rabbits showed very marked skin lesions and thinning of bones.” A. D. B.

SPIES (Tom D.) & DEWOLF (H. F.). **Observations on the Etiological Relationship of Severe Alcoholism to Pellagra.**—*Amer. Jl. Med. Sci.* 1933. Oct. Vol. 186. No. 4. pp. 521–525. With 1 fig. [10 refs.]

Over 90 per cent. of pellagrins investigated at Cleveland, Ohio, developed the disease after excessive drinking. These figures are probably representative of any northern city.

During the period March 1925–October 1931, 73 typical pellagrins were admitted to the Cleveland City Hospital or the Lakeside Hospital. Sixty-two of these 73 patients gave a history of severe alcoholism. That whisky itself is not a direct toxic agent is suggested by the fact that 10 pellagra cases recovered when given an adequate diet and yeast together with large quantities of corn whisky. It is probable that pellagra develops in alcoholic subjects because appetite is lost and drink is substituted for food.

A. D. B.

WALKER (N. P.) & WHEELER (G. A.). **Influence on Epilepsy of a Diet Low in the Pellagra-Preventive Factor.**—*Public Health Rep.* 1931. Apr. 10 Vol. 46. No 15 pp. 851–860. With 1 fig

An account is given of a series of epileptic patients kept upon a ketogenic diet low in P. P. factor. The appearance of pellagra in these cases is associated with a diminution in the number of convulsive attacks

The first group of cases comprised 10 white female epileptics in whom pellagra had never occurred previously. The basic diet used by GOLDBERGER and WHEELER for the study of the P.P. value of various foodstuffs was employed. The daily menu is reproduced. It is to be noted that this diet is not totally deficient in P.P. factor since cow-peas, tomato juice and yeast bread are present in small amounts. Within a few months after the commencement of this diet typical pellagra developed. In 7, stomatitis was the first symptom; bilateral symmetrical skin lesions were present in 9 of the 10 patients; some suffered from diarrhoea. It was observed that all but 2 patients showed a temporary reduction of about 50 per cent. or more in the number of fits at the time pellagra first developed or during its progress. In one case a second pellagra attack was allowed to take place and again a reduction in the number of fits was noted. In all cases after pellagra symptoms had been present for a variable time, depending upon the condition of the patient, treatment by yeast was instituted and cure soon followed. There was a tendency for the number of fits to increase again after the anti-pellagra treatment was begun.

A second group consisting of 8 white female epileptics was also investigated. The same basic diet as before was begun on June 23rd 1930. Seven of these patients developed pellagra by November 30th. This group also showed the same favourable effect of pellagra upon the epileptic attacks.

The explanation of this phenomenon is not yet clear. Deficiency in anti-pellagra vitamin may be responsible, but it is more probable that pellagra, acidosis and dehydration are merely indications of a more profound metabolic change which may account for the favourable effect on the epileptic state.

A. D. B.

TEGLBJAERG (Else) & TEGLEBJAERG (H. P. Stubbe). **Sekundaer Pellagra. [Secondary Pellagra.]**—*Hospitalstidende.* 1933. Mar. 30. Vol. 76. No. 13. pp. 356–364. With 6 figs. on 2 plates.

Having had their attention drawn to the possibility of cases of secondary pellagra being overlooked in asylums, Else and H. P. Stubbe Teglebjærg have scrutinized the present material as well as the records of discharged patients of a Danish mental hospital.

In the course of only half a year they have found five cases of secondary pellagra in this hospital, and their study of the records of discharged patients has led them to diagnose secondary pellagra in three other cases. The dietary of the hospital being such as to provide sufficient vitamin B₂ under normal conditions, the development of pellagra in these eight cases must probably have been due to defective vitamin absorption for which coincident or pre-existing disease of the digestive tract must be held responsible. In every case in which a diet rich in vitamin B₂ was prescribed, together with yeast or the Danish preparations, biosan or spinatin, a satisfactory response was observed. The authors suspect that secondary pellagra is a comparatively common disease in Danish asylums among those inmates who refuse to eat or are subject to chronic disease of the digestive tract. *C. Lillingston.*

SPIES (Tom Douglas) Pellagra: an Experimental Study of the Skin Lesions.—*Proc. Soc. Experim. Biol. & Med* 1933. June. Vol. 30. No. 9. pp. 1227–1228.

Pellagrins fed upon a diet of cornstarch and lactose showed definite improvement in their skin condition.

In a previous paper the author has shown that the skin lesions of pellagrins actually improved when they were fed upon a so-called pellagra-producing diet [see this *Bulletin*, Vol. 30, p 550]. The following is a continuation of that work using a diet even more restricted than before. Ten patients with typical pellagrous dermatitis were fed upon a diet of cornstarch and lactose (2,000–3,000 calories per day). Two of the patients were unable to tolerate the diet and had to be excluded, but 8 showed definite improvement in the skin condition during the first 6–15 days. Stomatitis was adversely affected, but those cases having no stomatitis at the beginning of the experiment did not develop it. None showed signs of nervous system involvement. It may be that “the specific chemical substance related to the development of the dermatitis is not the same as that affecting the other manifestations of pellagra.” Previous workers may have laid too much stress on the healing of skin-lesions in therapeutic experiments. *A. D. B.*

MULHOLLAND (H. B.) & KING (R. L.). Pellagra. Review of Cases with Special Reference to the Gastric Secretions.—*Jl. Amer. Med. Assoc* 1933. Aug. 19. Vol. 101. No. 8. pp. 576–579. [11 refs.]

Out of 107 pellagra cases 77 (72.0 per cent.) showed absent free hydrochloric acid in the gastric contents. The use of histamine did not materially change the anacidity percentage, which suggests that the anacidity is of the “true” type.

The authors give the following summary:—“The results of gastric analyses in 107 typical endemic cases of pellagra admitted to the University of Virginia Hospital during the past eighteen years confirmed the results found by previous observers in regard to the common occurrence of achlorhydria in this disease, even after due allowance has been made for the presence of this condition in normal persons of different ages. The examination of some patients indicated that this condition might be more or less permanent (true anacidity), but in a few instances some degrees of normal function returned. The assumption, however, that the presence of achlorhydria was necessarily correlated with such other manifestations as stomatitis, diarrhoea, involvement of the central nervous system and anaemia was not borne out by

this study. There is no implication that achlorhydria is a primary or uniformly antecedent manifestation of this deficiency disease syndrome." A. D. B.

WHEELER (G. A.) & HUNT (D. J.). **The Pellagra-Preventive Value of Green Cabbage, Collards, Mustard Greens, and Kale.** *Public Health Rep.* 1933. June 30. Vol. 48. No. 26. pp. 754-758.

An account is given of experiments upon the human subject to test the pellagra-preventive value of green cabbage, collards, mustard greens and kale.

These articles were added to a basic diet which is known to produce pellagra in 3-6 months. P.P. factor is not appreciably affected by the heat applied in the process of canning. The experiments were continued in each case for one year. The authors give the following conclusions : " (1) Canned green cabbage and canned mustard greens contain the pellagra-preventive factor and, though not fully adequate in themselves, may be regarded as quite practicable contributory sources for supplementing otherwise pellagra-producing diets. (2) Canned collards and canned kale are satisfactory pellagra-preventive supplements, at least when used in relatively large proportions." A. D. B.

LOWE (John). **Further Notes on Pellagra in Hyderabad, Deccan.**—*Indian Med. Gaz.* 1933. July. Vol. 68. No. 7. pp. 379-381. With 2 figs.

Pellagra is found in the general population of Hyderabad as well as in the local leper hospital.

The author has previously (1931) described pellagra in the Leprosy Hospital, Dichpali [see this *Bulletin*, Vol 29, p. 94]. Thirty new cases appeared during the cold weather of 1931-32. Observation suggests that the disease exists also in the general community apart altogether from leprosy. Hyderabad has a dry cool season in which the difference between sun and shade temperature is very marked. This leads to drying and cracking of the skin and though this condition is not, of course, due to pellagra it appears that persons severely affected in this way are more apt to develop the disease. Glossitis is a very characteristic feature. Of 7 patients who suffered from pellagra in 1930-1931 and were kept under observation only 2 relapsed during 1931-1932. In previous years the death rate was 25 per cent. but in 1932 when all marked cases were treated there were no deaths. Treatment consisted of the addition of $\frac{1}{2}$ lb. meat per day to the usual diet of rice, dal and jawari. Powdered medicinal yeast, 60 grains three times a day, was also given. A. D. B.

RAMAN (T. K.). **Pellagra in Guntur.**—*Indian Med. Gaz.* 1933. July. Vol. 68. No. 7. pp. 381-383. With 3 figs.

A clinical account with photographs of 4 pellagra cases observed at Guntur. Previously no cases had been reported in the Madras Presidency.

Case 1.—Hindu male (age 30) typical rash and chronic dyspepsia—ulcerative stomatitis and mental symptoms—no further investigations made as he refused to stay in hospital. Case 2.—Hindu female (age 35) history of rash for 7 years—typical skin appearances, glossitis, diarrhoea and anaemia—death occurred from extreme weakness and anaemia—

autopsy revealed the usual findings *Case 3*—Hindu male (age 14) seen apparently in second attack—symptoms gradually disappeared on liver extract (8 ozs. daily) toddy (6 ozs) and bread and milk *Case 4*—Mahomedan male (age 20) seen in second attack—his previous diet consisted of milled rice (4 ozs. three times a day), meat (once a week), vegetables (2 ozs daily) dal, fish, buttermilk and ghee He had never eaten maize The patient was given toddy (8 ozs. per day) and tonics He improved for a time, but relapsed later in spite of treatment A. D. B.

CLEMMESSEN (Svend). **Experimental Pellagra in Rats.**—*Acta Path. et Microb. Scandinavica*. 1933 Vol. 10. No. 3. pp. 304–314. With 15 figs.

“A description is given with photographs of some typical cases of pellagra in rats; concurrent gangrene of the tail and priapism are described”

GOLDBERGER and LILLIE first demonstrated that rats fed upon a vitamin B-free diet with the addition of adequate amounts of vitamin B₁ developed pellagra. In the experiments here described young albino rats stunted in growth by being kept on a vitamin B-free diet were used. These animals were kept alive for as long as 78 weeks by giving them a small weekly addition of about 0.5 gm. autolysed dry yeast. The earliest pellagra symptoms is slight scaliness of the skin of the hind paws between the toes. Later these patches become dark red in colour and crusts form. These become blackish owing to sub-epithelial haemorrhages. This appearance was usually noticed in from 16–23 weeks, but in sensitive animals it developed in about 4 weeks. Other regions affected are the fore paws, tip of muzzle, the ears and about the eyes. Irregular patches of epilation, dermatitis and crust formation may occur on the chest, flanks and back. The lesions are nearly always symmetrical. All the pellagra symptoms disappeared within 2 weeks when the animals were given a normal diet with sufficient yeast.

Thirty-nine of the 44 pellagrous rats developed a lesion at the tip of the tail which in 30 went on to gangrene. Priapism was noted in 21 out of 24 male rats. A. D. B.

CLEMMESSEN (Svend). Om experimental Pellagra og dens Betydning for Opfattelsen af Sygdommens Aetiologi. [**Experimental Pellagra and its Influence on the Conception of the Aetiology of this Disease.**—*Hospitalstidende*. 1933. Mar. 30. Vol. 76. No 13. pp. 349–356. With 4 figs on 2 plates.

In addition to giving an account of a case of pellagra in a human being, Clemmesen describes the changes observed in young rats fed on a pellagra-producing diet. When young rats are fed on highly purified casein and starch, to which codliver oil or butter has been added in sufficient quantities to assure an adequate supply of vitamin A, the rats die in a few weeks of beriberi. If, however, vitamin B₁ is supplied by the administration of an 85 per cent. alcoholic extract of maize flour dried on starch, the rats do not develop polyneuritis, but after some months 50 to 60 per cent. of them contract pellagra. Clemmesen has succeeded in arresting the growth of young rats on a diet deficient in vitamin B and has then kept them alive for many months on a small weekly dose of yeast, containing enough vitamin B₁ to prevent fatal polyneuritis, but not enough vitamin B₂ to prevent pellagra. After describing the manifestations of pellagra in the rat, Clemmesen states

that they all disappear quickly when sufficient yeast is given. But in the human case he describes, pellagra was contracted although an apparently adequate supply of vitamin B₂ was present in the patient's food. It is suggested that the chronic gastritis and achylia from which he also suffered were responsible for faulty absorption or metabolism of vitamin B₂.

C. Lillingston.

CAMPBELL (Coyne H.). **A Chemical Peculiarity of Pellagra Blood (Rapid Iodin Decolorization).** Preliminary Note.—*Amer. Jl. Med. Sci.* 1933. Aug. Vol. 186. No. 2. pp. 266-270.

The erythrocytes of pellagrous blood decolourize iodine solutions more rapidly than do erythrocytes in normal and other pathological conditions. A laboratory test based upon this observation is described.

The technique of the test is briefly as follows :—

5 cc normal (control) blood and suspected pellagrous venous blood are collected in 15 cc. centrifuge tubes containing 5 cc. liquid petrolatum. The tubes are well shaken and allowed to stand for 30-45 minutes, after which they are again vigorously shaken and centrifuged at 1,000 revs. per minute for 5 minutes. Three layers will be noted, the lowest being called the erythrocytic layer. 1 cc. of the erythrocytic layer is removed and placed in tubes and exactly 1 hour after the original withdrawal of the blood slowly and without shaking is added to each tube 5 cc. of an alcohol-ether mixture. The tubes are then stoppered and allowed to stand for about 6 hours at room temperature. At the end of this time to each tube is added 0.1 cc. Lugol's iodine solution; the contents are gently mixed and the tubes re-stoppered. As the mixtures stand, a gradual decolouration will be noted, more marked in the pellagra samples, so that within 3 hours pellagrous blood may be completely decolourized while other samples are not. Most constant differences occur after the tubes have stood for 12 hours. The tubes are then compared with potass. dichromate solutions of varying strength as colour standards and the reactions graded as mild, moderate, severe or negative.

One hundred and fifty cases, 50 of which were pellagrins, were tested in this way. Thirty-seven definitely diagnosed untreated pellagrins gave moderate to severe reactions. Ten pellagrins treated for 2-4 months gave negative to mild and moderate reactions. Six suspected cases gave mild to moderate and severe reactions. Three cases of active pellagra complicated by other diseases gave severe reactions. All other cases gave negative results, except 8 undiagnosed patients, who though pellagra was not suspected nevertheless gave moderate to severe reactions.

A. D. B.

HOFFMAN (Frederick L.); HARRIS (Leslie J.); HOFFMAN (Frederick L.). **Deaths from Pellagra.** [Correspondence.]—*Brit. Med. Jl.* 1933. Sept. 30, Oct. 7 & Nov. 18. pp. 623; 665-666, 943-944.

L. J. Harris in a recent address stated that no fewer than 30,000 individuals died from pellagra in one year recently in the southern parts of U.S.A. Hoffman, writing from Massachusetts, states that the mortality from pellagra has probably never been more than 7,000 in the course of any one year and gives the figures from 1927 to 1931, amounting to 30,000 for the 5-year period. Harris writes that he was referring to 1915 when PETERSON cited the official return of 10,663

deaths but considered the real mortality to have been 16,000 to 19,000. He does not say how he arrived at 30,000, but he would regard that "as a peak value."

Hoffman says further that there was a decline of pellagra in all the States for 1932. He draws attention to the excessive frequency of pellagra among females and gives a table of frequency in age periods for 1929, from which it appears that 45-54 years is the period at which pellagra deaths are most numerous. In U.S.A. at the present time the pellagra death rate is about 60 per million.

In his second letter Hoffman gives further figures from the U.S.A. Census Office and with reference to HARRIS' letter writes "No one has a right to broadly guess at a mortality figure and then defend it as a statement of fact." He gives a table of the mortality from pellagra in Italy from 1887 to 1928. This was 13.4 per 100,000 in 1890-2 and has since steadily diminished till in 1928 it was only 0.2. The actual diminution in deaths has been from 4,095 to 85. A. G. B.

RAJADHYAKSHA (B. H.). A Case of Pellagra.—*Bombay Med. Jl.* 1933. Mar Vol 2. No 3 pp. 49-50. With 2 figs & 1 chart

SULLIVAN (Elizabeth Ann). Insulin Therapy in Post-Pellagrous Trophic Ulcers.—*New England Jl. of Med* 1933 Aug 3 Vol 209 No 5 pp 241-242.

WHEELER (G. A.). Pellagra: a Review of Recent Literature—*Southern Med Jl.* 1933. July. Vol 26 No. 7. pp 648-653. [12 refs]

PLAGUE.

STRICKLAND (C.). **An Analysis of Seven Years Epidemics of Plague involving 2,520 Infected Villages in the Belgaum and Dharwar Districts, Bombay Presidency.**—*Indian Jl. Med. Res.* 1933. July. Vol 21 No. 1. pp. 29–65. With 3 charts.

In this analysis of the epidemic history of two Bombay districts the case records of a large number of infected villages have been scrutinized and charted. They reveal that the epizootic season extends from the middle of May to the middle of January, when the off season commences. It is during the off-season that anti-plague measures should be conducted with increased vigour.

A secondary rise of human plague incidence occurred in January "when the annual epidemic reaches its zenith, but the flea-rate is then near its minimum." That rise may find its explanation in the transport of the harvest "in spite of the low flea prevalence." Climatic and other conditions even in neighbouring districts may bring about variation in the incidence of plague. "It is essential, therefore," the author concludes, "that there be made a preliminary survey of the plague records" to determine when anti-plague operations are likely to have the greatest possible effect.

W. F. Harvey.

KING (H. H.) & IYER (P. V. Seetharama). **The Seasonal Prevalence of Rats and Rat-Fleas in Parts of South India.**—*Indian Jl. Med. Res.* 1933. Apr. Vol. 20. No. pp. 1081. 4. 67–10 With 1 chart.

This is an epidemiological study of importance, because it seeks to measure the effect of climate and anti-plague operations in a very systematic fashion. Briefly stated it has been carried out by surveys in localities which were representative of different types of climate, and although the data are somewhat scanty, the conclusions from them may perhaps hold for South India generally.

These may be summarized:—(1) The density of the rat population is higher during the cold weather and decreases during the hot weather, which decrease may be followed by a south-west monsoon rise. (2) Municipal trapping in one locality has not resulted in an appreciable decline in the rat population. (3) The average size of litter was fairly uniform for any one locality at all seasons of the year, nor had seasonal changes much effect on the pregnancy rate. (4) Both the general and the specific flea indices were markedly low during the hot weather months, when temperature was high but humidity was low. (5) *X. astia* appeared to be the first to respond, by increase, to the fall in the temperature and rise in humidity brought about by the south-west monsoon. (6) "With the onset of the cold weather after the north-east monsoon, *cheopis* continues to increase and increase very greatly. At this time *braziliensis* begins to increase. *Cheopis* seems to be the species most affected by seasonal changes."

W. F. H.

IYER (P. V. Seetharama). **A Rat-Flea Survey of the Mysore State.**—*Indian Jl. Med. Res.* 1933 Apr. Vol. 20. No. 4. pp. 975–994. With 1 map.

The fleas, to the number of 4,577, were collected on *R. rattus* and were representative of all three species of *Xenopsylla*. Relative prevalence of these species, *astia*, *braziliensis* and *cheopis*, is best shown

by their specific indices, 1.12, 2.74 and 3.1 respectively. A striking fact was that the indices for *astia* and *cheopis* varied little from place to place but that for *braziliensis* varied greatly. Another point of difference between species was that while the females of *X. cheopis* and *braziliensis* were only 36 and 33 per cent., they totalled 57 per cent. in the case of *X. astia*. A strong association is made out of *X. cheopis* with the cotton trade and *X. brasiliensis* with the grain trade. Both these species appear to be concerned with the transmission of plague but, as usual, the evidence is against *X. astia*. W. F. H.

- i. EVSEEVA (V.) & FIRSOV (I.) **The Suslik Fleas as Reservoirs of Plague Virus during Winter.**—*Rev. Microbiol., Epidémiol. et Parasit.* 1932. Vol. 11. No. 4. pp. 281–282. [In Russian. English summary p. 283.]
- ii. POLJAK (I.) & TOUMANSKY (V.). Le changement de taux saisonnier des puces dans les terriers des spermophiles *Citellus pygmaeus* Pall. au région de N. Tchirskaja. [Seasonal Variation of the Fleas in the Burrows of Spermophiles, *Citellus pygmaeus*.]—*Ibid* pp. 285–286. [In Russian. French summary p. 287.]

i. Fleas to the number of 5,363 were collected from the nests of susliks (ground squirrels), fed upon guineapigs and susliks infected with plague, and the nests with fleas replaced in the ground at the depth of a suslik burrow. Examinations were made of these fleas 3, 6 and 7 months later. Of 138 living fleas dug out from the 3rd nest, 7 months 12 days after the original feeding, 9 were found to contain plague bacilli. The experiment confirms the suggestion that plague bacilli may be preserved in fleas during a non-epizootic period and "carry the disease over from one epidemic period to another."

ii. The mean number of fleas per nest was 60, the maximum of fleas captured was in March and the minimum in September. The species found were: *Neopsylla setosa* (80.57 per cent.), *Ctenocephalus pollex* (7.58 per cent.), *Ceratophyllus tesquorum* (9.05 per cent.), *Frontopsylla semura* (2.21 per cent.) and *Rhadinopsylla uteramica* sp. n. (0.56 per cent.). W. F. H.

SICÉ (A.). Note relative aux porteurs insoupçonnés du bacille de Yersin. [Unsuspected Carriers of Plague.]—*Bull. Soc. Path. Exot.* 1933. May 10. Vol. 26. No. 5. pp. 688–692. [13 refs.]

The argument developed by the author is directed to the support of the possibility that man as well as the rat may be an agent in the propagation of plague.

Types of carrier which are considered are, (1) the healthy carrier; (2) the carrier of a localized symptomless lesion; (3) the ambulatory carrier; and (4) the chronic carrier. His illustrative case was a man of apparently good health, with no elevation of temperature whose only lesion consisted in a group of isolated, movable, painless glands in one groin. Puncture of the largest of these glands furnished a fluid which on microscopic examination showed what, morphologically, were plague bacilli. The examination was repeated weekly for about a month, always with the same result. Cultural and serological tests could not be applied. W. F. H.

LEGER (Marcel). *Pestis levissima*.—*Bull. Soc. Path. Exot.* 1933. June 14. Vol. 26. No. 6. pp. 762-764.

The term *Pestis levissima* is proposed by the author as preferable to *Pestis minor*, which he would reserve for a modified slight plague infection. In these cases of *Pestis levissima*, otherwise called healthy carriers, there are no symptoms except minute enlargements of lymph nodes, which are neither inflamed nor tender. Such enlargements may frequently be found in normal natives of the countries concerned, but the enlargements here referred to yield fully virulent plague bacilli by puncture. Other names which have been used for such a condition are latent plague and carriers of a silent local reaction. W. F. H.

DE ROZARIO (C. F.). A Case of Cutaneous Plague.—*Indian Med Gaz.* 1933. July. Vol. 68. No. 7. p. 396.

The patient, 22 years of age, was admitted to hospital after 4 days' illness with high temperature, but not looking at all ill. An acute spreading ulcer was present on the chest, which had started as a pustule, and a small hard mass was situated 4 inches above this. Two more spreading ulcers appeared and the ulceration covered finally about a square foot. Keratitis developed and the cornea was completely destroyed. Cervical, femoral and epitrochlear lymph nodes showed enlargement but not until the 12th day of the disease. There were no buboes at the time of admission. Although the patient was very seriously ill, he recovered. Smears from the ulceration showed *Past. pestis* and this finding was subsequently confirmed by animal experiment. W. F. H.

ROBIC (J.). Note sur le traitement de la peste par le bactériophage. [Treatment of Plague by Bacteriophage].—*Bull. Soc. Path. Exot.* 1933. May 10. Vol. 26. No. 5. pp. 756-760.

In this trial the bacteriophage which had proved successful at Dakar was used. It was tested for activity, was adapted to the plague strains of Antananarivo, showed practically the same activity for all the plague strains used in its preparation, was freshly prepared and was polyvalent. A test of the activity of the phage was also made with regard to a plague bacillus isolated from one of the patients treated. This was perfectly lysed. The use of the phage in pneumonic plague was absolutely without any effect. Of the five cases of bubonic plague treated three died and two recovered, but the author seems to discount the recoveries as therapeutic successes by relating how a patient had recovered by self-treatment with crushed pimento. His conclusion is that while the plague phage was active against laboratory strains it was unsuccessful in its application to treatment. W. F. H.

FADDEEVA (T.). The Role of Ticks in the Transmission and Preservation of Plague Virus. I. Experimental Infection of *Argas persicus* with Plague.—*Rev. Microbiol., Epidémiol. et Parasit.* 1932. Vol. 11. No. 4. pp. 273-278. [12 refs.] [In Russian. English summary p. 279.]

In this, the first of a series of experiments, the tick used was *Argas persicus* which was fed upon infected guinea-pigs when bacteraemia was at its height. To prove the presence of living plague bacilli the ticks were ground up to make a suspension in normal salt solution and

this was used to inject mice and to inoculate agar plates. The results showed that ticks can be infected and remain infective for as long as 110 days after the original meal. W. F. H.

BONCINELLI (U.) & ARADAS (A.). Sui rapporti tra *P. pestis* e *B. pseudotuberculosis rodentium*. I. Valore di alcuni mezzi culturali di differenziazione, saggi di agglutinazione aspecifica su stipiti normali e dissociati. [**Differential Culture Media for *Past. pestis* and *Past. pseudotuberculosis rodentium*. Non-specific Agglutination.**]—*Boll. Istituto Sieroterap. Milanese*. 1933. May. Vol. 12 No. 5 pp. 346-362 [40 refs.] German summary.

Many of the media which have been suggested for the differentiation of the plague and pseudotuberculosis bacilli were tested and only that with the composition rhamnose-peptone water was found satisfactory. The authors propose an asparagin-carbohydrate synthetic medium of pH 6 with bromthymol blue indicator as a further improvement, by which various strains of pasteurella organisms can be ranged in succession from the haemorrhagic septicaemia strains which are the earliest to alter the colour of the medium to the *P. pestis* which is the latest. Trials were also made of various non-specific agglutinating substances and it was found that trypanflavin agglutinated "R" type organisms, to which the plague bacillus belongs, and failed to agglutinate "S" type organisms to which the *P. pseudotuberculosis rodentium* belongs. With alteration of the latter to an "R" type it acquired and retained the reactions of a plague bacillus. W. F. H.

PANDIT (C. G.), MENON (K. P.) & IYER (P. V. Seetharama). **A Note on the Sun Disinfestation of Grains as a Measure in the Prevention of Plague.**—*Indran J. Med. Res.* 1933 Apr. Vol. 20 No. 4. pp. 1039-1044

The utilization of solar radiation for purposes of disinfection in tropical countries is a method which, if it could be rendered practical, would have the great merit of being inexpensive. In this series of experiments it was applied to the disinfestation of grain in gunny bags from fleas, as a plague preventive measure.

One thermometer was placed on the top of the bag, another just inside and touching the gunny, and four other thermometers at successive depths of about 4 inches, with readings every hour from 10 a.m. to 4 p.m. A number of different grains were used and interesting differences in the records were due to that fact alone. The basal fact which to some extent determined these trials was the known finding that "a temperature of 49°C. for 45 minutes is essential for the destruction of fleas." On this finding the sun trials made have been declared a failure in practice. "It would not be possible to obtain this critical temperature on all days and as the temperatures in the interior of gunny bags had always been lower than the critical one . . . it would not be possible to have the entire grain so disinfested." W. F. H.

ORI (Alessandro). Sterilizzazione del maiz infetto da bacillo della peste. [**Sterilization of Plague-Infected Maize.**]—*Ann. d'Igiene*. 1933. Apr. Vol. 43. No. 4. pp. 276-287. [23 refs.]

The occasion giving rise to this research was the arrival in a port of a grain-carrying steamer, some of the crew of which had suffered from plague and on which rats had been found dead with plague. A series of experiments instituted by the author led to the

conclusions that :—(1) The plague bacillus when sheltered from light can remain alive and virulent on maize for 54 days. (2) Plague infected maize when placed in the centre of a large quantity of the grain in the hold of a boat remains virulent for 14 days. (3) The grain, infected with plague, can be sterilized effectively by being kept in a drying chamber for 10 mins., at 70°C. (4) Half an hour in the chamber at 65°C. is sufficient to kill the insects with which the maize is infested and these temperatures cause no appreciable alteration in the appearance, the germinating power or the water content of the grain.

W. F. H.

FLU (P.). Immunisation des rats contre la peste au moyen de suspensions concentrées de bacilles pesteux virulents lysés par le bactériophage antipesteux. [**Immunization of Rats by Bacteriophage Lysates of Concentrated Suspensions of Plague Bacilli.**]—*Bull. Soc. Path. Exot.* 1933. June 14. Vol. 26. No. 6. pp. 796–806. [15 refs.]

—. Immuniseering van ratten tegen pest door middel van geconcentreerde bacteriophagaglysaten van virulente pestbacteriën (2e mededeeling). [**Plague-Immunization of Rats by Phage-Lysates of Virulent Bacteria.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. Aug. 15. Vol. 73. No. 17. pp. 1045–1058. [Refs. in footnotes.]

Flu has for some time drawn attention to the advantages of lysates by bacteriophage for protective vaccination. These lysates should be of concentrated bacterial suspensions and the organism should be virulent, because it is the bacterial substance that is the real immunizing agent and not the bacteriophage. It is this fact also which explains the successes and the failure of many other workers with such lysates, which may contain abundance of phage but little dissolved bacterial substance. An important feature of the phage lysate, concentrated though it is, is the absence of reaction on inoculation. The author summarizes his present work as follows :—

The vaccine-lysate protects 91 per cent. of animals against an infection with 10,000 minimum lethal doses and maintains its potency for at least 4 months at room temperature. To prepare the vaccine, a suspension of 24-hour old virulent plague bacilli in bouillon containing 5,000,000,000 bacteria per cc. is mixed with 2 per cent. virulent bacteriophage and incubated for 36 hours at 37°C. The partially lysed suspension is filtered through cotton wool, shaken up with an excess of chloroform and again left for 12 hours at 37°C. The fluid is then carefully decanted from off the chloroform and carbolized to $\frac{1}{2}$ per cent. It is now allowed to stand for 5 days at room temperature, when it is tested for sterility. Before use it is necessary to shake up the fluid, which is not wholly clear.

W. F. H.

PONS (R.) & ADVIER. Méthode expérimentale d'étude du pouvoir immunisant d'un vaccin anti-pesteux. Son application à un vaccin huileux et à un vaccin aqueux. Recherche de la phase négative et de l'action anergisante de la vaccination anti-pesteuse. [**Experimental Studies on Lipo- and Aqueous Plague Vaccine. Negative Phase and Stimulation of Infection by Vaccination.**]—*Ann. de Méd. et de Pharm. Colon.* 1933. Jan.-Feb.-Mar. Vol. 31. No. 1. pp. 5–24.

After various trials subcutaneous inoculation was adopted as the surest method of testing the immunity of vaccinated animals. Grey

mice (*Mus musculus*) were used as the test animals and 1/10 cc., containing a suspension of 200 bacilli, as the test dose. An interval of 10 days elapsed between this test dose and the previous prophylactic vaccination. The lipo- and the aqueous vaccine gave a 70 and 51.5 per cent. survival of the test animals respectively as compared with a 20 per cent. survival of control unvaccinated animals. As regards the negative phase of vaccination the authors found that instead of a diminution of resistance a slight increase of resistance was already evident in 24 hours after vaccination and that this steadily increased up to the 8th day. An injection of vaccine, however, given on the same day that an animal had been infected or during the actual evolution of the disease aggravated the disease. W. F. H.

REYNAL (J) & WASSILIEFF (A). Prophylaxie de la peste à Tunis, La station municipale de surveillance murine (laboratoire du rat). Son fonctionnement pendant une année (mai 1932-avril 1933). [**Prophylaxis of Plague in Tunis.**—*Arch. Inst. Pasteur de Tunis*. 1933. July. Vol. 22. No. 1. pp. 122-136. With 5 figs.]

The technique of examination of rats for plague is to make direct films from the spleen and if these should prove suspicious of plague infection to send the organs in a sterile tube to the laboratory. Inoculations are made from the organs on agar and suspensions of the organs injected into or rubbed into the skin of guinea-pigs. In every case, whether suspicious or not, one hind leg of the animal is sent to the laboratory, where it is cut across through the middle of the femur, the cut surface flamed, and the bone marrow sown with a platinum needle on agar. This use of bone marrow for sowing material has much to commend it especially as it is less liable to be contaminated than the spleen, liver or lung.

An investigation into the sex of the species of rats caught showed that for *E. decumanus* females were greatly in excess over males, for *E. rattus* they were in equal number and for *E. alexandrinus* the females again predominated. W F. H.

OTTEN (L.). Experimenteele vaccinatie tegen pest. I. Gedood vaccin [**Experimental Plague Vaccination. I. Dead Vaccine.**—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1933. July 4. Vol. 73. No. 14. pp. 835-857. [22 refs.]

— **Experimental Vaccination in Plague. I. Dead Vaccine.**—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië*. 1933. Pt. 2. pp. 61-80. [22 refs.]

By "dead" vaccine is meant one consisting of killed organisms or their products, whether this has been effected by heat, antiseptic or bacteriophage. A very useful précis of the literature on the subject, dealing with type of vaccine, dose, test animal, mortality during immunization, interval to testing dose and percentage survival is given, beginning with the work of KOLLE and OTTO (1903-4) and ending with that of SCHÜTZE (1922) and FRU (1932). The record of a certain amount of the author's own experimental work follows, which leads to important deductions. The susceptibility of different laboratory animals varies greatly and may lead accordingly to favourable or unfavourable vaccination results. For guinea-pigs the injection of a single virulent plague bacillus will determine a high mortality; the reverse is the case for a wild house rat. The susceptible guinea-pig is the

most difficult to immunize to virulent plague, while the less susceptible tame white rat is very easy. Wild house rats are intermediate between the two, but the tame white mouse corresponds as regards susceptibility to the house rat and approaches the tame white rat in respect of immunization results. Another of the deductions made is that the results of vaccination are very dependent on the size and type of the infecting dose. It cannot be said that the more susceptible the animal the worse the vaccination results will be or vice versa, for the white mouse proves an exception. The bearing of such facts upon the immunization of man is obvious and it would require, if it were possible, the use of the anthropoid apes to obtain veracious experimental results. The author refers to the fallaciousness of the statistics commonly presented of immunization of human beings against plague. His own results in Java during 1920-1922 on an alternate-case basis gave a diminution of mortality in the vaccinated to one half, a reduction which was considered, however, too small for the application of compulsory inoculation to the population.

All the work done on plague immunization points insistently to the necessity for the adoption of a standard method of testing.

W. F. H.

- BARRETT (R. E.) Epidemiological Observations on Plague in the Lango District of Uganda.—*East African Med. J.* 1933. Sept Vol 10. No. 6. pp 160-180. With 2 charts & 1 plan [17 refs]
- BOHEC (J.) Peste et Ratproofing.—*Ann. d'Hyg. Pub., Indust. et Sociale* 1933 July. Vol 10 No 7 pp 381-388.
- DUJARDIN-BEAUMETZ (E.) Remarque à propos de la communication de Marcel Leger sur les cas de *Pestis levissima*.—*Bull. Soc. Path. Exot.* 1933. July 12. Vol. 26. No 7 pp 892-893.
- FABIANI (G.) Nouveaux éléments de différenciation entre le bacille de la peste et le bacille de la pseudotuberculose des rongeurs.—*C. R. Soc. Biol.* 1933. Vol 113. No. 26 pp. 1198-1200.
- JOHNSON (F. H.) Report of a Case of Septicemic Plague in which practically the Only Symptom was an Elevated Temperature.—*U.S. Nav. Med. Bull.* 1933. July Vol 31 No 3 pp. 311-312.
- TSCHERNOBAEW (W.) Ueber den Kern bei *B. pestis* in Bouillonkulturen.—Reprinted from *Rev. Microbiol., Epidémiol. et Parasit.* 1932 Vol 11. No 4. pp. 255-257 With 1 fig. [In Russian. German summary p 257]
- WEBSTER (W. J.) Notes on the Study of Plague in the Field.—*Indian Med. Gaz.* 1932. Dec. Vol 67 No. 12 pp. 693-696.

CHOLERA.

OUCHI (T.). Recherches épidémiologiques sur le choléra à Changhai. Quelques observations au sujet des porteurs de germes cholériques. [Epidemiology of Cholera in Shanghai. Observations on Carriers.] —*Bull. Office Internat. d'Hyg. Publique* 1933. June. Vol. 25. No. 6. pp 998-1005.

Every year Shanghai is attacked by cholera in the summer but never in winter or in spring. Under these circumstances it is not easy to understand how this disease can be endemic. Shanghai lies at a distance of about 1,500 miles from the three possible foci, Indochina, Siam and the Philippines. The epidemiological observations of the last five years give the impression that cholera has been carried from South to North by vessels coming from Chinese ports. If, however, the view were accepted that cholera is actually endemic in Shanghai it would be necessary to determine how the vibrios are maintained by carriers during the off-season or, as an alternative, how the vibrios survive outside the body. Both these possibilities require investigation.

W. F. H.

SHIMOJO (K.), SODA (T.) & ADACHI (K.). On a Cholera Epidemic in Gosei, Taiehu-Shu, Formosa in July, 1932.—*Jl. Public Health Assoc. Japan*. 1933. Apr. Vol. 9 No. 4. pp 1-2.

This is a description of a cholera epidemic, brought to a place by a ship's crew, with 17 cases and 6 carriers, 23 in all, of whom 7 died. Twenty out of the 23 persons had attended the funeral of the captain of the junk and had consumed the infected food with the crew.

W. F. H.

- i. COUVY. Rapport sur les porteurs de germes de choléra. [Cholera Carriers.]—*Bull. Office Internat. d'Hyg. Publique*. 1933. July. Vol. 25. No. 7. pp 1149-1170. [3 pages of refs.]
- ii. ACTON; MORISON; STEWART (A. D.); TAYLOR. Les porteurs de germes du choléra.—*Ibid.* pp 1171-1179. With 1 diagram.
- iii. McMULLEN. Sur les porteurs de vibrions cholériques aux Philippines.—*Ibid.* pp 1180-1182.

This is a valuable review of the whole subject of cholera carriers, with a useful bibliography.

In it the investigator will find reference to the International Sanitary Conference of 1912 and to the Cholera Sub-commission of Paris in 1926 with their pronouncements. He will also find treated in the text the subjects of:—Number and distribution of carriers, proportion of agglutinable and non-agglutinable vibrios, duration of carriage, the occurrence of cholera in carriers, degree of danger from carriers, sterilization of carriers and the effect of vaccination on carriers. Under the heading "conclusions" there is given a summary of the position, mostly contained in the first sentence, which is probably the true position at the present time—"The question of germ carriers remains rather confused." Agglutinability of vibrios is an uncertain character in the absence of a standard agglutinating serum. Carriers are divided

into (1) those incubating the disease who are certainly infective : (2) the convalescent carrier ; and (3) the healthy carrier, the last being one of doubtful occurrence and of doubtful infectivity. No laboratory test serves to differentiate the vibrios discharged by these respective types of carrier. The serum of cholera convalescents possesses bacteriolysins and agglutinins, which are not present in the serum of the healthy carrier. As regards the effects of a satisfactory vaccination, there is little probability of finding a carrier incubating the disease, in the case of any one in whom vaccination has been carried out from 5 days to 6 months previously. The subject of sterilization of carriers requires fresh study. Whether special travel facilities should be accorded to healthy carriers with certificates of vaccination is left an open question.

ii. In this note there are given the several replies of the directors of the School of Tropical Medicine and of Institutes in India to a request for information. Acton divides carriers into (1) the acute, whose emission of typical agglutinable vibrios rarely exceeds the 14th day of the disease and (2) the carrier of the non-agglutinable vibrio which may be haemolytic or non-haemolytic. Vibrios of this latter type may make their appearance towards the 5th day of the disease but have not been met with later than the 14th day. Non-agglutinable vibrios may appear in cholera cases either at the beginning or the end of an epidemic. Hospital patients who have not been recently attacked with cholera will show in Calcutta non-agglutinable vibrios to the extent of 1 per cent. during March, April and June, the epidemic season, and none at all in the other months. In the reply of Morison a special emphasis is laid on the fact that although continued discharge of vibrios during convalescence is an actual fact, it has not been possible to point to infection arising through this agency. Stewart quotes the published figures of BRAHMACHARI, who in the endemic region of Bengal found that in an examination of 2,734 stools of healthy persons there were 344 cases with vibrios (23 agglutinable and 321 non-agglutinable). The agglutinable vibrios, however, were only found during the epidemic season. In Taylor's contribution a list of the works published from 1913 to 1931 on the subject of epidemics of cholera and the rôle of carriers was prepared and is included in Couvy's bibliography.

iii. This is quite a short note, which again voices the dubiety felt regarding truly agglutinable vibrios. "The serological identification of the cholera vibrio continues to present problems which have not yet been solved."

W. F. H.

MASSIAS (C.). Traitement du choléra par les injections intraveineuses de solution chlorurée hypertonique et de gonacrine. [**Intravenous Injection of Hypertonic Saline and Gonacrine in the Treatment of Cholera.**—*Bull. Soc. Path. Exot.* 1933. July 12. Vol. 26. No. 7. pp. 900-901.]

The author describes his treatment of cholera with 20 per cent. hypertonic salt solution intravenously in a dose of 20 cc., renewed after 12 hours and again, if necessary, after 24 hours. Further administration of salt solution is carried on by subcutaneous injection of normal salt solution. Immediately after the intravenous injections of salt solution intravenous injections of 2 per cent. gonacrine may be given.

W. F. H.

LINTON (Richard W.) & SHRIVASTAVA (D. L.). **Studies on the Antigenic Structure of *Vibrio cholerae*. Part II. Analysis of the Carbohydrates of Pathogenic and Non-Pathogenic Vibrios.**—*Indian Jl Med. Res.* 1933. July. Vol 21. No. 1. pp. 91–100.

The carbohydrate composition of organisms has in recent years shed new light on the chemistry of specific immunity. In this investigation an attempt is made to attack the problem of the relationship between pathogenic and non-pathogenic vibrios from this point of view. The author has shown that all the pathogenic and non-pathogenic vibrios, smooth and rough vibrios, agglutinating and non-agglutinating vibrios and strains resistant to various cholera bacteriophages contain a very similar carbohydrate group. "Each of them possesses in its carbohydrate fraction a factor which gives a precipitin reaction with antisera to any of the others."

Four strains of vibrio were used to provide material: (1) A typical smooth, agglutinable, agglutinogenic and pathogenic *Vibrio cholerae*; (2) a rough vibrio obtained from the previous strain by cholera-phage action, which had made it non-agglutinable; (3) a smooth, non-agglutinable water vibrio, and (4) a smooth-rough agglutinable vibrio. The methods and results of analysis of the specific carbohydrates are given in detail. Tentative conclusions are drawn by the author:—"Although the specific factors of the vibrios are so closely allied that they cross-react serologically in high dilution, yet the specific substances themselves are not identical and therefore the vibrios from which they are derived are different." One of the chemical differences between a pathogenic vibrio and a water vibrio "lies in the possession of galactose by the first and arabinose by the second." Other points which emerged in this investigation were that the rough variant resulting from bacteriophage action on a smooth vibrio altered neither the character nor the amount of its carbohydrate. "In the second place the carbohydrate does not vary in composition or amount with the agglutination reaction."

The author summarizes his position with regard to his test vibrios in these words.—"The identification of their constituents has led to the hypothesis that the carbohydrate of each vibrio contains an aldobionic acid made up of galactose and glycuronic acid; that a second sugar is also present; and that in some vibrios this sugar is galactose, while in other forms it is arabinose." *W F. H.*

STEWART (A. D.). Quelques remarques à propos des propriétés antigènes des vibrions cholériques. [**Antigenic Properties of Cholera Vibrios.**]—*Bull. Office Internat. d'Hyg. Publique.* 1933. June. Vol. 25. No. 6. pp. 995–997.

In this article there is developed the argument for the use in preparation of cholera vaccines of fresh local vibrio strains from an epidemic focus. The antigenic power of recently isolated smooth colonies is superior to that of the rough colony but smooth colonies tend to become rapidly rough at room temperature in Calcutta. Important researches have been carried out relating to the chemical structure of the cholera vibrio. The true cholera vibrio with its galactose fraction contrasts with water vibrios possessed of an arabinose fraction, but the arabinose of the latter is convertible into galactose by the action of sunlight and oxygen. Is it possible that some such change may occur in nature?

W. F. H.

CANTACUZÈNE (J.) Diagnostic microbiologique du vibron cholérique et choix d'un antigène pour la préparation d'un sérum agglutinant [Diagnosis of the Cholera Vibrio and Choice of Antigen for Agglutinating Serum].—*Bull. Office Internat. d'Hyg. Publique* 1933 June Vol. 25. No 6. pp. 984-994.

Recent work on the vibrios isolated during the Hejaz pilgrimage of 1930-31 have emphasized the need of a standard agglutinating serum for the recognition of the true cholera vibrio. The work of preparation of such a serum has been entrusted to the serological institutes of Copenhagen and Bucharest. A standard serum requires a standard antigen to produce it and this, as the author recognizes, involves a *petitio principii*, for the antigen must *a priori* be admitted to be a true cholera vibrio. The test antigen adopted should possess certain attributes.

It ought :—

(a) to have been isolated from the intestine of a fatal case at the height of an epidemic, (b) to be specifically agglutinated by the chief sera which have been prepared at the present day, and which have been prepared with an antigen of standard character, (c) to show Pfeiffer's phenomenon; (d) not to be agglutinable in a titre higher than 1-500 by sera prepared with an El Tor vibrio antigen or a vibrio isolated from healthy carriers or a convalescent of more than 15 days; (e) to be agglutinable by the serum of a patient who has, in an epidemic, recovered from a severe attack of cholera; (f) to maintain a stable specific agglutinability and virulence for the guineapig after continued subculture on agar; (g) when used as antigen, to furnish a serum agglutinating specifically the greatest possible numbers of vibrios considered to be true cholera vibrios from epidemic or endemic cholera foci

Having passed these tests a vibrio may be said to have attained the provisional rank of a standard cholera antigen, and is then subject to more detailed study. A large number of strains have been subjected to this study. As a basis for the selection of the "standard" serum required two antigens have been chosen and monovalent sera prepared from each. Both have been obtained from fatal cases of cholera, one being an old culture and the other recent. The vibrios differed from each other in so far as one was lysosensitive to phage, the other not, and one was haemolytic, the other not. Both agglutinated true cholera vibrios in a titre over 1-20,000. These two sera are recommended for test on vibrios. A vibrio should only be regarded as truly cholericogenic if agglutinated by at least a 1-1,000 dilution of serum.

W. F. H.

ASHESHOV (Igor N.), ASHESHOV (Inna), KHAN (Saranjam) & LAHIRI (M. N.). Studies on Cholera Bacteriophage. Part I. General Technique.—*Indian J. Med. Res.* 1933. Apr. Vol. 20. No. 4. pp. 1101-1125. With 1 text fig. & 16 figs. on 4 plates. [10 refs.]

Whatever may be the particular field of research taken up, there always appears some reference to the nature of the bacteriophage itself. This article on technique forms no exception. "I have myself only too often," says Asheshov, "doubted its living nature, but each experiment invariably led to the one conclusion—bacteriophage cannot be anything but a living being." After this preliminary challenging statement, the subject matter of technique is taken very thoroughly in hand. Its value lies in this, that what applies to the cholera vibrio,

applies nearly generally to other organisms also. "The basic principle of this technique is to treat bacteriophage as an ultramicroscopic 'filtrable' living organism." Certain fallacies have to be provided against and especially those of contamination, the use of a volumetric measure instead of the number of bacteriophage corpuscles per unit of volume, and the alteration of reaction during cultivation. Contamination with bacteriophage may be very widespread, tap water is contaminated and the laboratory itself may be contaminated. A wealth of detail is given of the technique to be followed for the final isolation of pure-line types and must be consulted in the original. "After the presence of bacteriophage is confirmed and the well-isolated discrete clearings are obtained their morphology must be attentively studied. It is necessary to do this after as few transfers as possible," else a slow growing bacteriophage may be eliminated by the dilution of subculture. The original filtrate should always be kept in reserve. Morphology of bacteriophage clearings is a matter of great importance in isolation of pure types, while size alone is of comparatively little importance.

W. F. H.

ASHESHOV (Igor N.), ASHESHOV (Inna), KHAN (Saranjam), LAHIRI (M. N.) & CHATTERJI (S. K.). **Studies on Cholera Bacteriophage. Part II. Classification of Bacteriophage and its Practical Application.**—*Indian Jl. Med. Res.* 1933 Apr. Vol. 20. No. 4. pp. 1127–1157. With 5 charts, 1 text fig. & 25 figs. on 6 plates.

Where a subject like bacteriophage theory is developing so rapidly, it is very essential for its understanding that detailed explanation should occasionally be supplied *ab initio*, as, otherwise, it is difficult to follow a writer's argument. This explanation is to a large extent furnished in this article together with the technique of isolation of "pure-line" or "ultra pure" phages. "A system of classification of bacteriophages based on their reciprocal compensatory action on bacterial culture, is suggested. A method called Type-Test is described giving the possibility: (1) of determining the type of bacteriophage, (2) of ascertaining the purity of a bacteriophage culture, (3) of identifying the different types present in a mixture, and (4) of testing bacterial cultures for the presence of bacteriophage (Ultra-purity Test). The use of bacterial cultures sensitive to one only of the types of bacteriophage is described." This is the summary of the work given by the authors. Size of clearings is the least important of the taxonomic characters of a phage. Their morphology too is unstable but "types of bacteriophage will almost always preserve under any circumstances the difference between themselves." Important characters are:—(1) the selective action of types and their division into those acting only on smooth bacterial elements, those acting on both smooth and rough and those acting almost exclusively on rough, (2) the unmistakably different antigenic action of the different types of phage, and (3) most important of all, the fact that vibrios which are "resistant to the action of one type of phage are still sensitive to the action of all the remaining types." These three type characters are stable and permanent and no intermediate types have been met with. A point which is well brought out is the condition for maintenance of lysis and non-appearance of secondary growth. "The lysis produced by pure-line cholera phage... is invariably followed by secondary growth." A permanent lysis is only effected by "combination of the best representatives of all the

types." The controversial subject of "lysogenic cultures" receives consideration and D'HERELLE's views with regard to these are more or less accepted. "They are cultures contaminated with bacteriophage or symbiotic cultures of bacteria-bacteriophage. . . . Such cultures will be actually nothing else but the secondary growth, resistant to the action of bacteriophage contaminating it." W. F. H.

ASHESHOV (Igor N.), ASHESHOV (Inna), LAHIRI (M. N.) & CHATTERJI (S. K.) **Studies on Cholera Bacteriophage. Part III. Virulence and Development of Bacteriophage.**—*Indian J. Med. Res.* 1933. Apr. Vol. 20. No. 4. pp. 1159–1188 With 3 figs. on 1 plate & 1 chart.

A specification of virulence is not easy to make out. The term is often misused and the authors lay great stress on the need of a definition for it, even though that may not be exhaustive in its characterization. They define the virulence of a bacteriophage as "its power to develop within and at the expense of bacteria." Two elementary principles enter into this definition and on these two combined depends the evaluation of the degree of virulence. The two principles are (1) the rate of destruction of bacteria and (2) the rate of multiplication of bacteriophage. Virulence is considered as an intrinsic property of the bacteriophage corpuscle and must be distinguished from the lytic power belonging to a given quantity of suspension or a given number of corpuscles. Number is not to be confused with individual potency. Full details are set out of the method of applying virulence tests. Much still remains to be investigated before finality is reached in this testing. It has to be recognized, moreover, that at present it has only a comparative, not an absolute value and, of course, can only be applied to single types. "The mixture of types can be investigated only from the point of view of its activity." Although the test is only "an estimation of the comparative rate of multiplication of bacteriophages it can be used for many purposes"; such as the choice of bacterium suitable for phage propagation. It can be used also to study the influence of environment on virulence, the possibility of increase of range of action and the influence of one phage upon another.

With this third part of the "Studies" the series, which is both important and valuable for reference, comes to an end. W. F. H.

PASRICHA (C. L.), DE MONTE (A. J.) & GUPTA (S. K.). **A Schematic Representation of the Variants of Cholera Vibrio produced under the Influence of Bacteriophage.**—*Indian Med. Gaz.* 1933. Aug. Vol. 68. No. 8. pp. 448–452. With 1 fig.

The authors, working with a large number of different types of cholera and other vibrio phages, have elaborated and clearly stated their views regarding the relationship of cholera vibrios, El Tor vibrios, non-cholera vibrios and paracholera vibrios. Not only have agglutinating vibrios been rendered non-agglutinable but, more important still, non-agglutinating atypical vibrios isolated in an endemic centre of cholera like Calcutta, have been rendered agglutinable. Two main types of bacteriophage have been used to bring about this variation, which is not to be called a mutation because it is reversible. The phages are the pure-line cholera phages and a closely allied series of phages isolated from waters in Calcutta, which receive the name cholera-like

vibriophages or simply vibriophages. These latter can act upon certain non-agglutinating vibrios to give secondary colonies which are not only specifically agglutinable by cholera serum but are also lysable by the pure line cholera phages. By this transformation the non-agglutinating vibrio becomes identical with the true cholera vibrio. In the laboratory then a typical cholera vibrio has been converted by the action of a cholera phage to a harmless saprophytic organism and this organism has had its true cholera characters restored to it again by the action of a cholera-like vibriophage

W. F. H.

COMBIESCO-POPESCO (C.) & WISNER (B.) Recherches sur l'agglutinabilité et la sensibilité au bactériophage des vibrions cholériques et paracholériques. [**Agglutinability and Phage-Sensibility of Cholera and Paracholera Vibrios.**—*C. R. Soc. Biol.* 1933 Vol. 113. No. 21. pp. 484-485]

This short note illustrates once more the divergent views held on the relation which exists between the cholera vibrio, the El Tor vibrio and those haemolytic strains which are comprehensively called paracholera vibrios. Ninety-seven organisms belonging to these classes were available for study, of which 67 were considered, at the outset, to be authentic cholera. All of these latter were agglutinated by the testing serums used and 63 were sensitive to bacteriophage. Of the 19 El Tor vibrios obtained in the pilgrimage of 1930, 15 were non-agglutinable and 4 were agglutinable by some one or other testing serum but not by others. No inagglutinable vibrio was sensitive to bacteriophage.

W. F. H.

BERNARD (P. Noël), RAYNAL (J.) & LIANG (Wang). Remarques sur quelques souches de vibrions cholériques isolés en Indochine et sur les variations de leurs caractères sous l'influence du bactériophage. (2e note.) [**Cholera Strains in Indo-China and Variation of their Characters under the Influence of Bacteriophage.**—*Bull. Soc. Path. Exot.* 1933. July 12. Vol. 26. No. 7. pp. 896-899.]

The characters investigated in this second note [see this *Bulletin*, Vol. 30, p. 536] were haemagglutination, haemodigestion and haemolysis. Out of 16 strains of cholera vibrios some have been transformed by bacteriophage from agglutinable vibrios into non-agglutinable, from vibrios giving a normal nitroase-indole reaction to those giving a strong reaction, from strongly proteolytic to weakly proteolytic and from non-haemolytic into haemolytic.

W. F. H.

BERNARD (P. Noël) & GUILLERM (Jean). Sur la lyse transmissible du vibron cholérique. [**Transmissible Lysis of the Cholera Vibrio.**—*C. R. Acad. Sci.* 1933. July 10. Vol. 197. No. 2. pp. 201-203.]

The authors set out from a pure culture which shows neither transmissible lysis in fluid media nor plaques in solid media and obtain from it by a method of extraction of a diastase, after only 2 to 3 hours' incubation, a transmissible lytic principle. "This substance has all the characters of an activator of the diastase which in normal cultures produces an autolysis of vibrios."

W. F. H.

FLU (P. C.). Het El-Tor vraagstuk in verband met de bacteriologische en serologische diagnostiek der cholera-vibrionen. [**The El-Tor Question in Relation to Bacteriological and Serological Diagnosis of the Cholera Vibrios.**]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1933. Aug 29. Vol. 73. No. 18. pp. 1107-1137. [Refs. in footnotes]

In this article the identity of the El-Tor vibrio with the cholera vibrio is discussed. It is purely arbitrary to consider that the agglutinable El-Tor vibrio is not a cholera vibrio. A true cholera vibrio which is, to begin with, non-haemolytic can acquire haemolytic characters. On the other hand the constancy of the haemolytic character of the agglutinable El-Tor vibrio forms a marked contrast to its inconstancy in old cholera strains. Cholera vibrios isolated from acute cases are agglutinable to titre limits, give the Pfeiffer reaction, show complement fixation with specific cholera serum, present the phenomenon of haemodigestion on 10 per cent. goat-blood agar plates with the formation of a broad green zone round colonies and fail, even after some days incubation, to haemolyse erythrocytes in 10 per cent. goat-blood bouillon. Agglutinable vibrios which show haemolysis in goat-blood bouillon should not be regarded as cholera vibrios until further careful examination. There is a possibility that cholera vibrios which have remained long in the human body develop haemolytic characters rendering them indistinguishable from the agglutinable El-Tor vibrio.

W. F. H.

ZIMMERMANN (E.). Ueber die Beziehungen zwischen Cholera- und El Tor-Vibrionen. [**Relation between Cholera and El Tor Vibrios.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1933. Vol. 79. No. 3/4. pp. 219-240. [26 refs.]

We do not yet appear to have reached finality on the subject of the identity of the cholera and El Tor vibrios. It is this latter group only which causes real difficulty. In Germany the generally accepted view, based upon the impossibility of separation of the two organisms serologically, is that they are identical. The material available for investigation consisted of 71 reputed cholera, 28 El Tor and 14 other vibrio strains. Serological tests again confirmed the view that, with the usual immune sera, a differentiation of cholera from El Tor vibrios is not possible. One of the test strains was a doubtful cholera; if this be left out, it was found that, in a peptone water-asparagin-ammonium lactate-citrate blood medium, all the 112 strains with one exception preserved their haemolysing or non-haemolysing character. Two out of 69 cholera strains were haemolysing, whilst only one out of the 28 El Tor and 14 other vibrios showed any variability in its strong haemolysing character. It must be concluded that the place of the El Tor strain among the vibrios is not yet settled.

W. F. H.

YEN (Albert C. H.). Phenolphthalein Starch Medium for Rapid Isolation of *V. cholerae*.—*Proc. Soc. Experim. Biol. & Med.* 1933. Apr. Vol. 30. No. 7. pp. 884-887.

This medium is recommended for trial in cholera and is made and used as follows:—

(1) Prepare:—Peptone (Witte) 2 gm., maltose 1 gm.; pot. nitrate 0.5 gm.; sod. carbonate (crystallized) 0.5 gm.; sodium chloride 10 gm.;

mag chloride (crystallized) 0.5 gm., distilled water 900 cc (2) Boil 3 min and filter (3) Add 100 cc. 5 per cent starch, previously boiled for 2 minutes. (4) Mix thoroughly (5) Filter through cotton wool and then through asbestos filter. (6) Measure the amount of the filtrate (7) Sterilize by boiling for 3 minutes (8) Keep in ice chest till required. (9) Add, just before use, 5 cc of the indicator phenolphthalein (saturated solution in 50 per cent alcohol) per litre (10) Bring the solution carefully to neutralization point (pH 8.3) by addition of either N/20HCl or N/20NaOH as required (11) Add finally, after this neutralization, exactly 1.5 cc. N/1NaOH to give it a pH of 9.0-9.2 (12) Distribute in amounts of 50 cc into sterile flasks for seeding (13) Use fresh (14) Add 0.1-0.2 cc liquid stool or a loopful of solid to 50 cc medium and incubate at 37°C for 5-8 hours. (15) Watch for the decolourization of the solution that indicates growth of cholera or cholera-like vibrios (16) Apply agglutination tests to the surface growth with known anti-cholera serum. (17) Transfer 1 cc. of growth, if decolourization is incomplete at the end of 8 hours, to fresh medium, incubate and test again

W. F. H.

YASUKAWA (Yutaka). **Experiments on Sea Water and *Vibrio cholerae*.**—*Japanese Jl. Experim. Med.* 1933. Apr 20 Vol 11. No. 2. pp 119-127. With 3 figs. [11 refs.]

Sea-borne transmission is the mode of origin of cholera in Japan in each successive year. The importance therefore of the viability of the *V. cholerae* in sea water is a matter of some importance. Its viability in an artificial sea water in a tank was 22 days on the surface and about 30 days at the bottom. If exposed to sunlight through variously coloured glass plates, sterilization was effected through the colourless and cobalt glass plates within 2 hours. The cholera vibrio lives longer in sea water than in fresh and the most favourable salt concentration was that of equal parts fresh and sea water with a specific gravity of 1.0137. Magnesium chloride was found to have "a far more favourable influence on the viability of *Vibrio cholerae* than any other salt."

W. F. H.

CHEN (W. K.). **Rough Forms of *Vibrio cholerae* from Convalescents.**—*Proc. Soc. Experim. Biol. & Med.* 1933. Apr. Vol. 30. No. 7. pp. 887-891.

Twenty-one positive cases were investigated and 18 of these were followed right through convalescence.

During the early acute stage of the disease when cholera phage had not appeared positive pure colonies of smooth type and lysable by cholera phage were obtained in abundance. With convalescence and the appearance of cholera phage, smooth colonies became scanty or disappeared and rough resistant variants with low titre agglutination of 1 in 160 to 1 in 640 took their place. These variants also showed impaired motility and non-motile colonies of rough cholera vibrio were isolated in 4 cases. The motility could be restored by subculture. One of the most interesting observations in this research was the finding in 5 of the convalescents a few colonies of absolutely non-agglutinable cholera-like vibrios. A well planned test of the serological relationships of these three classes of vibrios was conducted with the appropriate sera for each. As a result of these tests the author concludes that there is no evidence to show positively that the non-agglutinable cholera-like vibrios were mutants of the true cholera vibrio, nor could they be brought back to

true cholera vibrios. The slightly agglutinable rough variants, on the other hand, including those which were non-motile, "have a weak somatic antigen in common with the true smooth cholera vibrio. They are reversible and are actually the true rough variants of cholera vibrio apparently resulting from the bacteriophage action during the natural course of the disease"

W. F. H.

CALVANO (Umberto). Il colera sperimentale nel coniglio. [**Experimental Cholera in the Rabbit.**—*Giorn. d. Batter. e Immunol.* 1933. Aug. Vol. 11. No. 2. pp. 264–272. English summary (8 lines).]

The method used was that of ORSI by injection into the gall bladder. A suspension of cholera from a 24-hour agar culture, of a strength equal to 10 loopfuls per cc in dose of 0.1 to 0.2 cc., formed the injection material. Ten rabbits were injected, of which 5 died in 24 to 36 hours and one after 10 days. Microscopic preparations from the bile or contents of the duodenum showed vibrios in long spirals, an arrangement which was probably due to the bile, for the vibrios from the small intestine only rarely amounted to 2, 3 or 4 united elements. Control injections made with double the dose directly into the small intestine were unsuccessful, while an injection of a whole agar slope intraperitoneally produced no effect. In these experiments it has been found therefore that the injection of quite small quantities of cholera vibrios by the gall bladder route have produced all the features of human cholera in the rabbit when the injection of larger amounts into the peritoneum, the circulation or the small intestine were without effect. Such cholera infection could be produced likewise with almost avirulent old laboratory cultures.

W. F. H.

DAMBOVICEANU (A.). Agglutination par les acides de vibrios cholériques et paracholériques. [**Acid Agglutination of Cholera and Paracholera Vibrios.**—*C. R. Soc. Biol.* 1933. Vol. 113. No. 21. pp. 485–487.]

With the technique employed positive agglutination by the acid appeared after 1 to 2 hours at the optimum pH, that is to say at the isoelectric point of the vibrio. This agglutination gradually extended so as to include the neighbouring pH, and the iso-agglutination zone became sharply defined in 18 hours. All the cholera vibrios used, numbering 63 serologically authentic strains, were agglutinated by acids with optimum at pH 3.2 except the Pasteur Institute strain Pottevin in which the optimum was at pH 3.5. The zone of iso-agglutination varied somewhat and was 1.2 to 5, 2 to 4, 3 to 4.6 for 12.3, 30 and 15.4 per cent., of vibrios respectively. In 5.1 per cent. of the vibrios there were two optima and two zones, although the maximum agglutination always showed at pH 3.2. The paracholera vibrios could be divided into, 58 per cent. with optimum and zonal agglutination similar to those of the cholera vibrios, 20 per cent. with a totally different optimum, and 28 per cent. quite inagglutinable in the range pH 1.7 to 9.2.

W. F. H.

- GHOSH (H), GUPTA (Benoy Kumar Sen) & BOSE (Saroj Kumar) On the Nature of Cholera Toxin and Symptoms of Cholera—*Jl Indian Med Assoc* 1933. July Vol. 2 No 2 pp 443-445
- KIRIBAYASHI (Shigeru). Supplementary Report on the Biological Peculiarities of *Vibrio Cholera* I On the Differentiation of Cholera *Vibrio* and Cholera-like *Vibrio* II. On the Development of *Vibrio Cholera* on Starch-Agar-Media.—*Taiwan Igakkai Zasshi (Jl Med Assoc Formosa)* 1933. May Vol 32 No. 5 (338) [In Japanese With 2 coloured plates English summary pp 65, 66]
- KLEINE (F. K) Zur Erinnerung an Robert Kochs Entdeckung des Cholera-bazillus—Reprinted from *Ztschr f. ärztliche Fortbildung* 1933. Vol 30 No 13 pp 385-386

MEDICAL ENTOMOLOGY.

JANISCH (E.). **The Influence of Temperature on the Life-History of Insects.**—*Trans. Roy Entom. Soc. Lond.* 1932. Dec. 31. Vol. 80. pp. 137-168. [15 refs.]

During the last few years we have seen much critical work on the relation between insects and environmental factors; study has been devoted particularly to such simple physical elements as temperature and humidity. The purpose of work of this type is to explain, if possible, the enormous fluctuations in insect populations which are frequently observed. It has been known for long that temperature is of outstanding importance in relation to rate of growth and movement, also reproduction and mortality, and many have tried to find the curve which best expresses the relation of temperature to the velocity of development. The hyperbola is frequently used, but it is clear from the present paper that this is only a rough method and that it has no theoretical basis. Janisch and many others have endeavoured to use the exponential type of curve, similar to that which relates temperature to the velocity of chemical processes. In the present paper he expresses the view that a complex curve derived from the exponential type is the only one that is suitable. The reviewer is not competent to consider all the evidence, but it is not clear to him that the biological data are sufficiently exact or uniform to support the elaborate mathematical structure which is erected on them.

The author deals with many other matters of great general interest, and the paper is important because it may help to give us a better understanding of the effect of climate upon insect populations.

P. A. Buxton.

NIESCHULZ (Otto). Ueber die Bestimmung der Vorzugstemperatur von Insekten (besonders von Fliegen und Mücken). [**Determination of the Temperature preferred by Insects.**]—Reprinted from *Zool. Anzeiger*. 1933. Vol. 103. No. 1/2. pp. 21-29. With 4 figs.

The author made use of an apparatus consisting of a long metal tank, one end of which was inserted into an ice-box, the other into a chamber which was maintained at 50°C. When such an apparatus has run for a few hours, it comes into thermal equilibrium, and different parts of the long tank remain at different steady temperatures. He liberated insects into this tank, observing through its glass lid the part of it at which they chose to rest. Observations of temperature at intervals along the tank were taken at the same time. It was found that female *Stomoxys calcitrans* arrived at their "preferred temperature" in about half an hour, and that they remained between 27° and 32°C. Females of *Culex pipiens* in October, at a time when they are just going into hibernation, disposed themselves at the extreme cold end of the tank.

P. A. B

NEVEU-LEMAIRE (M.) Les arthropodes hôtes intermédiaires des helminthes parasites de l'homme [**Arthropods that are Intermediate Hosts of Helminths Parasitic in Man.**—*Ann. Parasit Humaine et Comparée*. 1933. May 1, July 1 & Sept. 1. Vol. 11. Nos 3, 4 & 5. pp. 222-237, 303-319, 370-402. [5 pages of refs.]

The information is classified on a rather elaborate zoological basis, but the paper contains a great body of data and will certainly prove useful as a summary. It is not possible to test it for completeness except by taking a particular case, and the reviewer has studied the facts which are given about the vectors of *Wuchereria bancrofti*. Many of the records which have been published are unreliable, because they show only that wild mosquitoes of a particular species have been dissected and found to contain nematode worms which were assumed to belong to this species. The summary should state more clearly than it does that some of the records are open to this grave objection: in general the author does not make it clear whether the original paper related to infection of bred mosquitoes or dissection of those caught wild. The author has rightly included a number of mosquitoes in which the development of this parasite only proceeds to a certain point, but it would have been of value if the information about imperfect development had been fuller. There is, for instance, no reference to BÄHR'S discovery that the non-periodic *Wuchereria* of Fiji cannot develop completely in *Culex fatigans*.

The paper includes a number of old records which are now known to be erroneous; there is no doubt that the author has decided wisely in including these and in pointing out the possible cause of the errors.

P. A. B.

POPOW (P. P.) & GOLZOWA (R. D.). Zur Kenntnis der Wasserstoffionenkonzentration im Darmkanale einiger blutsaugender Arthropoden. [**The Hydrogen Ion Concentration in the Alimentary Canal of Some Blood-Sucking Arthropods.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. Oct. Vol. 37. No. 10. pp. 465-466.

The hydrogen ion concentration was determined by means of the quinhydrone electrode. No details of technique are given. The following results were obtained: *Culex pipiens* female, pH 6.87-7.05; *Anopheles maculipennis* female, pH 6.89; *Cimex lectularius*, pH 6.2; *Pediculus vestimentalis* female (gut contents and body fluid mixed), pH 7.12-7.21; *Ornithodoros lahorensis* infected with relapsing fever spirochaetes, 7.39-7.60; the same non-infected, pH 7.72-7.80.

V. B. Wigglesworth.

STEWART (A. D.) & MOORTHY (V. N.). Lethal Properties of Aqueous Extract of Young Bamboo Shoots.—*Indian Med. Gaz.* 1933. June. Vol. 68. No. 6. pp. 320-323. With 1 chart.

The juice from the soft inner core of bamboo shoots 1-1½ feet in height, extracted with an equal quantity of water quickly killed guineaworm embryos, cyclops and mosquito larvae and adults. Two factors seem to be responsible for the toxic effect. (1) Free hydrocyanic acid, produced perhaps by the action of a specific enzyme upon a cyanogenic glucoside; (ii) a substance of unknown nature which

persists after all the hydrocyanic acid has volatilized. It is hoped to apply this method of slow production of hydrogen cyanide for the control of insects in the field.

V. B. Wigglesworth.

PARMAN (D. C.). **A Box-Type Trap to aid in the Control of Eye Gnats and Blowflies.**—*Circ. U.S. Dept. Agric. No. 247.* Wash. D.C. 1932 Nov. 4 pp. With 1 fig.

— **Construction of the Box-Type Trap for Eye Gnats and Blowflies.**—*Mimeographed Circ. U.S. Dept. Agric. Bur. Ent., E. 299.* Wash. D.C. [1932.] 4 pp. With 4 plates [Summarized in *Rev. Applied Entom.* Ser. B. 1933 Vol. 21 Pt. 9. p. 210.]

"In the course of investigations on the control of the eye-gnat, *Hippelates pusio*, Lw., begun in 1928, a box type of trap has been evolved that has been used successfully during two seasons in California, where this pest is extremely troublesome. It has also been adapted for trapping blow-flies and house-flies. Its main features are the following: large quantities of baits can be used to disseminate odours without requiring the hovering flies to enter the region where these are so concentrated as to be apparently more or less repellent, immature flies breeding in the baits are prevented from escaping, both chemotropic and phototropic responses can be utilised; the trap can be adapted to permit flies to enter it without entering the bait chamber, it can be constructed in sizes large enough to contain large carcasses on ranches where it is not feasible to burn dead animals, and in places where it would be advantageous to use large quantities of garbage for baits until it could be otherwise disposed of. The odours are disseminated by currents of air driven into the bait chamber through the funnel-shaped openings. Investigations also indicated that stirring the baits (especially the liquid baits used for eye-gnats) greatly increases the catch, and in 1930 a simple and inexpensive windmill bait agitator was devised. It may be possible to utilise the trap in breeding a continuous supply of parasites and predators of the flies. In the second paper detailed specifications and instructions are given for making these traps and the bait agitator. The cost of the traps is discussed.

"As the traps are intended to attract insects from a distance, they should not be placed in shut-in situations nor exposed to high winds, the most suitable positions are in open groves or thin plantings of trees or shrubs, or on ranges with a moderate low growth of vegetation or open high timber, with one of the two entrances facing away from the prevailing wind. The bait used for the eye-gnat trap was generally 1 lb. beef or pig's liver and 2 ozs. urea to 4 U.S. gals. water. The best catches were made when the bait was partly or wholly covered with water, and where enough water is used to float the baits, the windmill agitator may be employed with advantage. If parasites are not being reared, it has been found advantageous to add one teaspoonful of nicotine sulphate to each U.S. gallon of water as a larvicide."

HINMAN (E. Harold). **The Role of Bacteria in the Nutrition of Mosquito Larvae. The Growth-stimulating Factor.**—*Amer. J. Hyg.* 1933. July. Vol. 18. No. 1. pp. 224-236. [15 refs.]

The effect of bacteria upon the growth of mosquitoes belonging to the genera *Culex*, *Aedes* and *Anopheles* has been studied over a period of four and a half years. Most of the experiments have been made with *Aedes aegypti*. It is shown that moderate numbers of bacteria in the culture medium stimulate growth, but excessive contamination causes death. If the bacteria in an otherwise suitable culture medium are killed, whether by autoclaving, by keeping at 60°C. for 30 minutes, or

with 10 per cent. formaldehyde, the growth-stimulating factor is destroyed. Attempts to isolate this vitamin-like substance from the bacteria failed. It is not filtrable from bacterial cultures, nor could it be extracted by grinding the bacteria in aqueous media, alcohol or ether (In a few cases, however, perfect growth was obtained in sterile media after the addition of the extract, so it is possible that slight modification in technique might give regular results). There is some evidence that fungi and yeasts play a similar rôle in the nutrition of mosquito larvae

V B Wigglesworth

SHUTE (P. G.) **A Simple Method of obtaining Eggs of Mosquitoes.**—*Ann Trop Med. & Parasit* 1933 Oct 21. Vol. 27. No. 3 pp. 469-470.

Eggs of mosquitoes may frequently be obtained by confining a wild female in a small cage with water and raisins, but sometimes this is not successful. The author has no difficulty in obtaining eggs, and in getting them at the moment when he wants them, by stunning the female and putting her on the surface of water in a watch glass. As she recovers from this assault, she generally lays a large number of eggs.

P. A. B.

HAMLIN-HARRIS (R.). **Some Ecological Factors involved in the Dispersal of Mosquitos in Queensland.**—*Bull Entom. Res* 1933. July. Vol. 24. Pt. 2. pp. 229-232 With 1 plate

The chief problem that is here discussed is the presence of abundant mosquitoes in parts of Queensland apparently devoid of water. Several factors are concerned. (i) Migration from breeding places elsewhere. This is notably the case with *Aedes vigilax* which breeds in enormous numbers in brackish or salt water pools on the coast and is carried inland for distances up to sixty miles by north-westerly winds. These migrations occur only when the atmospheric humidity is high; indeed, in summer the appearance of large numbers of *A. vigilax* inland heralds the approach of a storm. The same remarks apply to *Mucridus alternans*, though the predaceous larvae of this species are not restricted to salt water. (ii) The existence of breeding places in tree holes, etc., which are overlooked by the casual observer. This is the case with *Aedes notoscriptus* which may be very prolific in apparently waterless regions. (iii) Extreme localization of mosquitoes, breeding, during the dry season, in small residual collections of water liable to be overlooked.

V. B. Wigglesworth

HINMAN (E. Harold). **Enzymes in the Digestive Tract of Mosquito Larvae.**—Reprinted from *Ann. Entom. Soc. of America*. 1933. Mar. Vol. 26. No. 1. pp. 45-52. [16 refs.]

The digestive enzymes in the alimentary canal of the larvae of *Aedes aegypti* and *Culex quinquefasciatus* consist of an amylase, an invertase, an enzyme that hydrolyses xylose, and a protease acting in an alkaline medium.

V. B. Wigglesworth.

UNITED STATES NAVAL MEDICAL BULLETIN. 1933. July. Vol. 31. No. 3. pp. 323-334.—**Mosquito Control in Haiti.**

An admirable and stimulating report describing work done in the vicinity of Port au Prince, by the American Scientific Mission to Haiti, during the fiscal year 1931-32.

By "oiling latrines and controlling vast areas in and near the city," malaria-carrying and troublesome mosquitoes have been "noticeably reduced," and as a result an expected outbreak of malaria in one section of the city did not take place. The extent and growth of the work are suggested by the increased quantities of mosquito oil and Paris green used in this period.

For the control of mosquito breeding in pit latrines, into which water enters, a spray consisting of "a mixture of 5 per cent. crude cresol, 10 per cent. kerosene, and 85 per cent. Diesel engine oil" proved most suitable. The so-called "Panama Whale," made of native rope with a 30-lb. weight in the front end, and saturated with oil, smooths, grooves and oils simultaneously, and is of much help in controlling open ditches, all of which in or near the city are thus treated once a week. Contrary to common belief, but agreeably with the present reviewer's experience, tadpoles were found not to prey on mosquito larvae. Much attention was naturally paid to drainage, and the divers forms of drain, both surface and subsurface, used in various conditions of locality and soil, are described and contrasted. So far as possible, especially within the city boundaries, the closed subsurface drain, at least 30 inches below ground and with a minimum pitch of 0.5 per cent, was employed.

Brief notes are given on fourteen species of mosquito met with in or near Port au Prince, where *Aedes aegypti*, carrier of yellow fever and dengue, was found breeding in pit latrines. *Anopheles albimanus*, a dangerous vector of malaria and the only known carrier of the disease in Haiti, is common below 2,500 ft., but does not breed in dense shade. *Aedes sollicitans*—not a disease carrier but a "great nuisance"—breeds in saline shore-pools, and often occurs in swarms which, like those of *A. taeniorhynchus*, "may travel inland for 40 miles or more." Thus the experience of W. H. W. Komp in the Panama Canal Zone, that any mosquito which attacks man "will, if produced in excessive numbers, fly much farther than is normally considered the flight range of that particular mosquito" in order to feed, has been confirmed in Haiti.

E. E. Austen.

VANNI (Vittorio). Ancora un progresso nella delarvizzazione dei Culicidi. (*Advance in the Larval Control of Culicidae*.)—*Riv. di Malarologia* 1933. May-June. Vol. 12. No 3. pp 532-534. With 1 fig. English summary (6 lines) p. 653.

This is an interesting paper. After a few introductory remarks on the usual diluents or admixtures such as road dust with Paris green, the author describes the effects of a powder obtained after distillation of bituminous schists at low temperature. It is of a brown colour, slightly oily to the touch, in fact it contains an oily residue from the distillation. When thrown on water it forms a very thin film which, if the water is undisturbed, persists for some weeks, and the interspaces between the particles of the powder become occupied by minute fatty or oily droplets. Even after heavy rain very little of the powder falls to the bottom, and if the force be enough to break the film it very soon re-forms.

As regards its effects on mosquito larvae, those of *Anopheles* die more rapidly than those of *Culex*, though it is very effective with the latter also and impedes emergence from the pupae. The mechanical effect of the powder alone is great, but this can be enhanced by the

additional toxic effects of Paris green, if desired. [Unfortunately the author does not state whether it has any trade name, nor does he mention the price nor whence it can be obtained] H. H. S

FERMI (Claudio). Diserbo biologico delle acque. (**Biological Clearing of Ponds.**)—*Riv. di Malariaologia*. 1933. May-June Vol 12. No. 3. pp. 523-531. English summary (6 lines) p. 653.

The claims of the carp are brought forward as far surpassing those of *Gambusia* as a mosquito larvivore. As evidence the experiment carried out at the Barratz pond or marsh of 60 hectares extent in the north-west of Sardinia is related.

In October 1925 *Gambusia* were introduced and again in the spring of the following year. Although they multiplied well, they proved ineffectual as regards the larvae, because the vegetation consisted largely of *Spirogyra* and *Zannichellia palustris* and was so dense that even small boats could not penetrate it. In May, 1926, six thousand carp (Galician species) were introduced, and, to the wonderment of the fishermen and other local inhabitants, destroyed the whole of the vegetation, the moorhens previously present in countless numbers disappeared for lack of food, and a close search "failed to detect a single culicid larva." H. H. S.

HOUEMER (E). Observations sur quelques poissons dulcaquicoles culiciphages du Tonkin. [**Observations on Freshwater Culiciphage Fish of Tonking.**]—*Bull. Soc. Méd.-Chirurg. Indochine*. 1932. Oct. Vol. 10. No. 7. pp. 740-746.

The author advises the use in Tonking of *Anabas scandens* and *Macropodus viridauratus* for destruction of larvae. The fish which devour larvae in an aquarium are the following in order of efficiency :—

1. *Anabas scandens*, Daldorf ;
2. *Macropodus viridauratus*, L. (= *M. opercularis*, L.),
3. *Carassius auratus*, L.,
4. *Rasbora lineatus*, Pellegrin ;
5. *Toxabramis Houdemeri*, Pellegrin, 1932,
6. *Culter brevicauda*, Gunth ;
7. *Barbus hannani*, Lehberger, 1929.

The determinations were made in each case by Dr PELLEGRIN of Paris. *Anabas scandens*, the climbing perch, is extremely voracious ; their flesh is much esteemed and they reach a weight of 50 gm ; they live in water containing little oxygen. *M. viridauratus*, the paradise fish, is a good feeder. It is too quarrelsome to put in collections of water with other fish. The well-known *C. auratus* increases at a surprising rate, 1,300 weighing 6 kgm. placed in a rice field of an area of one hectare gave 5 months later a total weight of 120 kgm.

The enemies of these fish are discussed and it is noted that the metacercariae which infest their scales should be studied in case they form part of the life cycle of *Clonorchis sinensis*.

[*Carassius auratus* is a well-known host of *C. sinensis* and FAUST has shown that cysts from fishes of the families *Percidae*, *Centarchidae* and *Umbridae* will infect dogs and cats.] A. G. B.

LEWIS (D. J.). **Observations on *Aedes aegypti*, L. (Dipt. Culic.) under Controlled Atmospheric Conditions.**—*Bull. Entom. Res.* 1933. Sept. Vol. 24. Pt. 3. pp. 363–372. With 5 figs. [13 refs.]

The author describes methods of breeding and manipulating adult and early stages of mosquitoes. many of them are ingenious and labour-saving. The mosquito, *Aedes aegypti*, does not possess an efficient mechanism for reducing loss of water if it is kept in dry air. The length of life is therefore much less in dry air than in moist, though it is not directly proportional to the saturation deficiency. Mosquitoes which are kept so that they can drink water live materially longer than those which are kept in saturated air without the possibility of drinking. This observation remains unexplained and is curious, because one would suppose that in saturated air the insect could not lose water and must therefore die when it has exhausted some other substance. The paper includes a considerable body of fact relating to the duration of life of individuals of both sexes, fed and unfed, exposed to a number of different temperatures and humidities. The figures relating to survival in dry air at rather high temperatures are interesting in relation to the work of BEEUWKES, KERR, WEATHERSBEE, TAYLOR (this *Bulletin*, Vol. 30, p. 350).

A piece of apparatus is described within which mosquitoes can be applied to the skin. Air of controlled humidity is circulated slowly through the apparatus so that evaporation from the skin does not sensibly affect the humidity. With this the author shows that the yellow fever mosquito bites most readily at temperatures between 25° and 30°C. At 20°C. and below it, and also at 35°C. and above it, the insects feed less readily. Within the optimal zone of temperature they feed more freely if the air is nearly saturated than if it is drier, but a small proportion fed (4 out of 36) at 30°C. and 0 per cent. humidity, that is to say, under conditions of desiccation which are greater than any prevailing within the natural range of the species. The insect's willingness to take blood is partly determined by climatic conditions, but partly also by the size of the container. The author records that if mosquitoes are confined in a very small tube and held close to the skin a much larger proportion feed than if they are kept in the apparatus which he normally used.

P. A. B.

MERTENS (W. K.). Muggenbroedplaatsen in de directe omgeving van enkele woonwijken te Batavia in verband met dengue. [**Mosquito-Breeding Places in Residential Districts of Batavia in Relation to Dengue.**]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1933. Aug. 29. Vol. 73. No. 18. pp. 1096–1106. With 1 fig.

This article presents the results of a survey of mosquito breeding places and considers the possibility of effectively dealing with them as a prophylactic measure against dengue, not to mention filariasis and even yellow fever. Dengue although not a fatal disease is in some districts a scourge and a cause of considerable loss of working time. The anti-mosquito measures are of the well known type. One suggestion especially is, however, worth considering which is to make the discovery of mosquito larvae a punishable offence on the part of the owner of the property, more particularly the finding of well grown larvae and still

more of pupae.* The fine to be levied on the delinquent would be made progressively larger with repetition of the offence. *W. F. Harvey*

EDWARDS (F. W.), PATTON (W. S.). **The Identity of *Culex aegypti*, L.**—*Ann. Trop. Med. & Parasit.* 1933 July 7 Vol. 27. No. 2. pp. 357-360.

A reasoned argument, for the confuting of PATTON [this *Bulletin*, Vol. 30, p. 614], is given by Edwards in support of his contention that the quondam *Aedes* (*Stegomyia*) *fasciata* is the mosquito described as *Culex aegypti* (1762) by Linnaeus, whose trivial name should therefore henceforth be adopted for the yellow fever mosquito. In the present reviewer's opinion, at any rate, the author succeeds in establishing his case, although he fails to insist on what is perhaps the most cogent piece of evidence of all, namely that since Linnaeus clearly uses "corpus" in the sense of "abdomen," his "puncta candida . . . in corpore . . . longitudinaliter sita" cannot possibly, as supposed by PATTON, refer to the markings on the sides of the thorax.

PATTON, in the spirit of the remark, widely known though entirely apocryphal, attributed to the Italian astronomer, sticks to his opinion that the name *aegypti* should be dropped *E. E. A.*

RILEY (William A.) & LIANG-YU (Wu). **The Anopheline Mosquitoes of China.**—Reprinted from *Lingnan Sci. Jl.* 1932. Apr. Vol. 11. No. 2. pp. 175-191. With 13 figs. [24 refs.]

Although, according to the authors, in the whole gamut of disease in China malaria is second in importance only to tuberculosis, existing knowledge of Chinese anophelines is hopelessly inadequate. Lists of species collected round about Peiping, Canton and Hong Kong are available, but these form but a beginning, and mosquito literature in general is not only vast but scattered, and largely inaccessible to the Chinese student. As a preliminary contribution to the more intensive work which is urgently required, the present paper should prove of real value. It includes a "Key to Mosquitoes of the Genus *Anopheles* Reported for China or Indo-China"; useful and practical "Hints for Collectors"; and a Bibliography. The need for accurate identification of species, and a close study of their bionomy and ecology before embarking on an anti-mosquito campaign is emphasized. *E. E. A.*

- i. TOUMANOFF (C). Sur le peuplement anophélien du bassin du Fleuve-Rouge au Tonkin. [**The Anopheline Population of the Basin of the Red River, in Tonking.**]—*Bull. Soc. Path. Exot.* 1933. May 10 Vol. 26. No. 5. pp. 741-747.
- ii. TOUMANOFF (C). Recherches sur la fréquence saisonnière de diverses espèces anophéliennes au Tonkin (Bassin du Fleuve Rouge). Première note: *A. (Myz.) minimus* Théo. et *A. (Myz.) aconitus* Dön. Deuxième note: *A. (Pseudomyzomyia) vagus* Dön. [**Seasonal Frequency of Various Species of Anophelines in Tonking (Red River Basin).**]—*Bull. Soc. Path. Exot.* 1933. June 14. Vol. 26. No. 6. pp. 857-863. With 1 diagram. pp. 863-867. With 2 diagrams.

i. Statistics are given based on two years' investigations into the anopheline fauna of the Red River basin in Tonking, and derived from

* This practice is not unknown in British Colonies; e.g., in Freetown, Sierra Leone, in 1931 there were inspected 131,277 compounds. Mosquito larvae were found in 574 and the occupiers prosecuted. 549 were convicted and fines totalling £109 6s. were imposed.—Ed.

the examination of a total catch of 26,858 larvae and 13,992 adults. The commonest species were found to be *Anopheles vagus* and *A. hyrcanus* var. *sinensis*. A significant fact is the very high proportion of the principal malaria carriers, especially *A. minimus*, in the middle and upper regions of Tonking, which are the most fever-stricken.

ii It is pointed out that the seasonal abundance of the different anophelines is a matter of great practical importance, species normally zoophile, and of little account as vectors of malaria, may yet take part in transmission and bring about sudden epidemics, if in excessive numbers at certain seasons. The richness of the Far Eastern anopheline fauna necessitates great caution in incriminating species as malaria carriers; and even when one or another kind of *Anopheles* has been found to be infected, knowledge of seasonal frequency will show whether such aptitude for transmission is constant or merely temporary.

In the case of *A. minimus*, the principal malaria vector in Tonking, seasonal frequency was studied for two years in three areas in the Red River basin, in which the anopheline fauna is similar, and this species is constantly present. As a result, *A. minimus* was found to be most abundant from November to March, that is during the winter monsoon. The reasons for its diminution during the rains are discussed. For *A. aconitus*, November and December would appear to be the period of maximum frequency, at least in the larval stage. *A. vagus*, which, as stated above, is one of the commonest species of its genus in Tonking, was most prevalent in both larval and adult stages in August and September, part of the rainy season when temperature is variable. Breeding chiefly in pools of stagnant water, this mosquito adapts itself to temporary accumulations due to rain, while the temperature from May to August accelerates development by curtailing the duration of the larval stages.

E. E. A.

GIBBINS (E. G.). Eggs of Some Ethiopian *Anopheles* Mosquitos.—*Bull. Entom. Res.* 1933. July Vol. 24. Pt. 2. pp. 257-262. With 10 figs.

Up to the present, the eggs of most of the African species of *Anopheles* have been undescribed. In the present paper the eggs of ten of them are described and figured, and the author's observations are compared with previous descriptions when available.

The paper is of some general interest, because any detailed morphological work may throw light on the inter-relationships of *Anopheles* of the *funestus* group. Several members of this group are of great importance in relation to malaria, and at present it is a matter of great difficulty to distinguish between them. The group that centres round *A. marshalli* also presents systematic problems of unusual difficulty. It is interesting to notice that some differences have been observed, even between the eggs laid by a single female of this species. The reviewer understands that the collecting of eggs of *Anopheles* in nature is now commonly practised by malariologists in South Europe, as they find it easier to identify eggs than larvae. Possibly, if work of this sort is pushed forward, it may be used in the same way in Africa.

P. A. B.

GIBBINS (E. G.). **The Domestic *Anopheles* Mosquitoes of Uganda.**—*Ann. Trop. Med. & Parasit.* 1933. Apr 10. Vol. 27. No. 1. pp 15-25 [10 refs.]

In the review of this paper (this *Bulletin*, Vol 30, p. 608), it is wrongly stated that *A. mauritanus* var. *zemannii* showed an infection rate of 0.3 to 0.5 per cent. This species was *not* incriminated in the natural transmission of malaria
V. B. Wigglesworth

TRENSZ (F) Etude expérimentale sur la fonction des chambres à air de l'oeuf d'*Anopheles maculipennis*. [**Function of the Air Chambers of the Egg of *A. maculipennis***].—*Arch. Inst. Pasteur d'Algérie*. 1933 June. Vol 11. No 2 pp 192-197 With 1 plate. [13 refs.]

Experiments made with *A. maculipennis* in Algeria lead the author to the conclusion that the air chambers of the eggs function as balancers and not as floats. It is the surface tension that buoys up the eggs.

A. G. B.

DMITRIEV (I. D.) & ARTEMIEV (A. I.). [**On the Viability of the Aquatic Stages of *Anopheles*.**].—*Med. Parasit. & Parasitic Dis.* Moscow. [1933]. Vol. 1. Nos. 5-6. pp. 259-261. [In Russian.]

Working in the Caucasus, the authors made observations on the viability of the aquatic stages of *Anopheles maculipennis*. In one case the relative numbers of larvae of different stages were estimated by taking fifty samples every ten days in the course of a summer from four natural water reservoirs. Instead of the expected predominance of later stages of the larvae as the observations progressed, it was found that, on the contrary, the later the stage of the larvae the smaller their number. Estimates showed that of the larvae of the 1st instar only 67 per cent. survived to the 2nd instar, 40 to the 3rd, and 25 to the 4th. This question was afterwards studied experimentally, on the progeny of 20 females. The eggs were in each case laid in Petri-dishes with water. Out of 3,278 eggs, 2,090 (63.8 per cent.) larvae were hatched. Further observations were made in artificial pits connected with an irrigation canal, the temperature and pH of the water being daily recorded. Into each pit were placed from 500 to 1,000 eggs and as soon as pupae made their appearance the pits were covered with gauze and the emerging adults were daily caught and counted. Out of the total number of 3,750 eggs placed in the pits only 685 (15.6 per cent.) reached the adult stage, the survival of various stages per 100 eggs being as follows: larvae 1st instar 63.8; 2nd 42.7; 3rd 25.5; 4th 15.9; adults 15.6.
C. A. Hoare.

NABOKOFF (V.), GORJAINOFF (A.) & BEKMAN (A.). Arsmal (arsenite de cuivre) nouvelle preparation pour la lutte contre les larves d'anophele. [**Arsenite of Copper for Antilarval Use.**].—*Med. Parasit. & Parasitic Dis.* Moscow. 1933. Vol. 2. Nos. 1-2. pp 59-65. [In Russian.]

Experimenting with various chemicals at the Toxicological Department of the Moscow Tropical Institute, the authors tested the effect of copper arsenite (CuHAsO_3) upon the larvae of anopheline mosquitoes. Both laboratory and field tests showed that practically 100 per cent. of the larvae can be destroyed by employing preparations of copper

arsenite with an arsenic content not below 9 per cent., in doses of 1 kilogram per 1 hectare of surface. The preparation is used in the form of a powder mixed with 9 parts of peat dust, and is sprayed either by means of a hand pulverizer or from an aeroplane. Apart from its superior larvicidal properties "Arsmal" is said to be cheap to produce. [Arsmal is evidently akin to, if not identical with, Paris green.]

C. A. Hoare.

SALITERNIK (Z.). The Breeding of *Anopheles mauritanus* in Palestine.
—*Bull. Entom. Res.* 1933 Sept. Vol 24. Pt. 3. pp. 343–344

From July to September, 1932, larvae of *A. mauritanus* "always in association with *A. hyrcanus*," were found by the author in small overgrown pools adjoining the Kurdani River, near Acre. The chemical composition of the water is given, and it is stated that *A. mauritanus* a doubtful malaria-carrier in nature, is not a house-haunter.

[*A. mauritanus* was among six species of *Anopheles* found by the present reviewer, in the summer of 1918, breeding in the R Auja region of Palestine, some 55 miles south-west of the locality referred to above cf. AUSTEN, *Trans. Soc. Trop. Med. and Hyg.*, 1919, Vol. 13, p. 55—a record which has been overlooked by subsequent writers.]

E. E. A.

ROUBAUD (E.) & COLAS-BELCOUR (J.). Observations sur la biologie de l'*Anopheles plumbeus*. II.—L'asthénobiose 'cyclique' hivernale. [Observations on the Biology of *Anopheles plumbeus*. II. Cyclic Hibernation Asthenobiosis.]—*Bull. Soc. Path. Exot.* 1933. July 12. Vol. 26. No. 7. pp. 965–972 [13 refs.]

The tree-hole breeding *Anopheles plumbeus*, which usually winters as a larva (this *Bulletin*, Vol. 29, p. 835), exhibits at this season a notable slowing-down of development. This diapause or asthenobiosis is not dependent upon temperature, but is a spontaneous process cyclically recurring in the life of the species. In the course of experiments by the authors, the minimal duration of larval life in May and June was from 22 to 29 days; on the other hand, under the same conditions of temperature and food, larvae hatched from a batch of eggs laid on 6th September took from 135 to 271 days to reach the pupal stage. Larval life therefore, without any change in temperature or environment, spontaneously becomes from six to nine times longer in winter than in summer. The development of hibernating larvae in a condition of asthenobiosis, which may set in at any stage, cannot be accelerated by warmth, while exposure to higher temperatures (77–82°F.) results in death in the second or third stage. Neither light nor food have any effect and, at the close of winter, development is resumed only after a long period of repose at a low or fairly low temperature. Whether hibernation asthenobiosis is exhibited by *A. plumbeus* throughout its range, or is racial in character, cannot yet be determined. E. E. A.

GATER (B. A. R.). Notes on Malayan Mosquitoes, IV. Anopheline Larvae of the "Umbrosus Group."—*Malayan Med. Jl.* 1933. Sept. Vol. 8. No. 3. pp. 180–189. With 24 figs. [25 refs.]

Among the twenty-nine species of *Anopheles* known to occur in the Malay Peninsula (this *Bulletin*, Vol. 30, p. 607), there are six in which

the branches of the abdominal palmate hairs of the larva, instead of being flattened, are filamentous, forming so-called "cockades". The species which exhibit this abnormality are—*Anopheles brevipalpis*, *A. hunteri*, *A. baeszi*, *A. separatus*, *A. similissimus* and *A. umbrosus*. Although this grouping is more or less artificial, some of these species are distinguishable with difficulty, either as larvae or adults, and have not infrequently been mistaken for *A. umbrosus*. In addition to a key, this paper gives in some detail the diagnostic larval characters of five of the species concerned. E E A.

MARTINI (E.), MAYER (F.) & WEYER (F.). Ueber die Durchwinterung unserer *Anopheles maculipennis* [The Overwintering of *Anopheles maculipennis* in Germany.]—*Riv di Malarologia* 1932. Nov-Dec Vol 11. No. 6 pp. 753-784. With 3 charts [Refs. in footnotes] English summary p. 940.

Anopheles maculipennis passes the winter in the adult (fertilized female) state, either (var. *labbranchiae*) in outbuildings containing livestock, or (var. *messeae*) in cellars, barns, lofts and similar places not so occupied and therefore colder. In the former case hibernation is incomplete, and at intervals a meal of blood is taken; in the latter the insects are rigid and motionless, and do not feed during their winter rest. The segregation of the two races, as observed by the Dutch investigators, is thus confirmed. While intermediate conditions, and even exceptions due to local influences are met with, the causes of these distinctions are to be sought in the existence of varieties or races of the species, as demonstrated in Holland and Italy.

The present lengthy addition to the ever-increasing number of papers concerning the racial question in *A. maculipennis* deals with the mode of overwintering in North Germany (Emden, Cuxhaven and Schwerin regions), displayed respectively by what appear to correspond to the Italian vars. *labbranchiae* (with short wings and dappled grey eggs) and *messeae*, which has long wings and lays banded eggs. In the case of the latter variety oviposition ceases, and the change to the hibernating condition takes place, in September; in the former, in the region of Emden, egg-laying markedly diminishes in the first half of August, and may entirely cease by the middle of the following month.

The difference between the races in the manner of overwintering is not of a profoundly physiological character, but consists in the inclination of the one which lays dappled grey eggs to seek out, in order to pass the winter, places different from those selected by the other race; naturally these are not the same as the summer retreats, but have a different "micro-climate." On the conclusion of hibernation there is a definite contrast between the races; in the one which lays dappled grey eggs the change to an active condition is usually gradual, in the other it takes place suddenly. After hibernation, in the area covered by the observations described, readiness for oviposition occurs in the race which deposits banded eggs about four weeks later than in the other, though in this connexion meteorological conditions naturally have great effect. The authors consider that their results definitely confirm the theory, advanced by DE BUCK, SWELLENGREBEL, VAN THIEL and others, that the differences in the overwintering of *A. maculipennis* are due to the diverse behaviour of the two races.

A method of determining the winter cholin content of *A. maculipennis*, which averages 0.67 per cent., is described. E. E. A.

WEYER (F). Grosse und Maxillenzahnzahl als Unterscheidungsmerkmal der Rassen von *Anopheles maculipennis* und ihre Beziehungen zur Umwelt. (Size and Maxillary Index as Differential Characters of the "Anopheles maculipennis" Races. Their Relation to Milieu.)—*Rev. de Malarologia*. 1933 May-June Vol 12 No 3 pp 487-520 With 18 graphs English summary (9 lines) p 652.

"Between the German anopheline races of *atroparvus* and *messeae* we observe little but constant differences in the maxillary index The size of these races—especially that of their wings—undergoes variations in the same locality not only in the course of a year, but also in successive years Sometimes *atroparvus* has longer wings than *messeae*.

"These variations seem to depend on the influences of milieu (climate, breeding places) Then they are not to be considered as genotypical characters The size appears to have no practical differential value As far as the reaction to milieu is concerned, *atroparvus* shows a greater adaptation power"

RAYNAL (J) & LE GAC (P). Etude sur plusieurs lots de phlébotomes capturés dans différents quartiers de Marseille. [*Phlebotomus* of *Marseilles*.]—*Ann. Parasit Humaine et Comparée*. 1933. July 1. Vol 11 No. 4 pp. 249-267. With 1 map

A collection of 602 adult *Phlebotomus* made in and around Marseilles between July and September 1932 comprised 585 *P. perniciosus*, 16 *P. papatasi* and 1 *P. larroussiei*. Both the former species attack man, but whereas *P. papatasi* was always found resting during the day inside houses, *P. perniciosus* was always in stables, outhouses, etc. The high proportion of the latter species taken is interesting in view of the fact that it is the presumptive carrier of Mediterranean kala azar, many cases of which are reported every year from Marseilles. The taxonomic differences between the species mentioned are described in great detail.

V. B. Wigglesworth.

HASE (Albrecht). Ueber heftige, blasige Hautreaktionen nach Culicoides-Stichen. [*Severe Vesicular Skin Reactions after Culicoides Bites*.]—*Ztschr. f. Parasitenk.* 1933. Sept. 6. Vol. 6. No. 1. pp. 119-128. With 2 text figs. [29 refs.]

Our knowledge of the effect of insect bites upon man has been greatly increased in the last ten or fifteen years. The problem has been approached from the zoological and also from the medical side, and recent advances in the study of immunity have provided valuable experimental methods In the present work the author presents detailed observations of a patient who was bitten by midges (*Culicoides*). He describes the successive stages in the development of a large vesicular lesion The view is expressed that lesions of this type are probably always caused by the bites of *Culicoides*, though they are frequently attributed to mosquitoes.

P. A. B.

GIBBINS (E. G.). Studies on Ethiopian Simuliidae. *Simulium damnosum*, Theo.—Reprinted from *Trans. Roy. Entom. Soc. London*. 1933. June 30. Vol. 81. Pt. 1. pp. 37-51. With 27 figs. & 1 plate.

The exceedingly blood-thirsty and appropriately named little fly known as *Simulium damnosum* is here described in all its stages, and from both sexes of the adult, from material obtained at Jinja, Uganda,

where the typical specimens of the species were collected by CHRISTY some thirty years ago. In view of CHRISTY's statements as to the abundance of *S. damnosum* at certain seasons (a belt of the insect 12 or 15 miles or more in length, and 3 or 4 miles wide, along the right bank of the Nile)—statements which probably fall far short of the truth—Gibbins, who was impeded in his search by the strength of the current and by the presence of crocodiles, evidently failed to find the main breeding-place. It is noted that the insect breeds only in the most turbulent and most highly aerated parts of the river, and that the adults seem to be capable of flying thirty miles. Contrary to the habit of the British *S. reptans*, which usually bites the forehead, *S. damnosum* seems by preference to attack the lower extremities. [At Brazzaville on one occasion ROUBAUD found the fly in swarms round the legs of sleeping sickness patients.] *S. damnosum*, which is believed to occur throughout Equatorial and in many parts of subtropical Africa, has already been found by BLACKLOCK, and also by BEQUAERT, to be a carrier of *Onchocerca volvulus*. E. E. A.

LAAKE (E. W.), PARMAN (D. C.), BISHOPP (F. C.) & ROARK (R. C.).
The Chemotropic Responses of the House Fly, the Green-Bottle Flies, and the Black Blowfly.—U.S. Dept. of Agric. Washington. Technical Bull. No 270. 1931. Nov. 10 pp

Many chemicals have been tested as attractants or repellants for *Musca domestica*, *Lucilia* spp., and *Phormia regina* in the presence of raw meat. Pine tar oils are the most effective repellents and have been recommended as a dressing for the protection of wounds on animals from the screw worm fly (*Chrysomya macellaria*). Clove oil and clove powder are moderately effective repellents, and mixed with vegetable oils and applied over the surface of fresh meat, they have proved useful in protecting this from flies at camps. Geraniol, bromoform and some other substances increased the attractiveness of meat, but there were considerable differences as between the different species of flies.

V. B. Wigglesworth.

NIESCHULZ (Otto). **Some Remarks about the Rôle of True Blood-sucking Musca Species as Transmitters of Diseases.**—Ann. Trop. Med. & Parasit. 1933. July 7. Vol. 27. No. 2. pp 213-214.

In view of a statement by PATTON that nothing is known of the capabilities of true blood-sucking species of *Musca* as transmitters of pathogenic organisms the author gives a brief review showing that *M. crassirostris* has proved to be capable experimentally of transmitting surra, anthrax and haemorrhagic septicaemia of buffaloes.

A. G. B.

MALLOCH (J. R.). **Exotic Muscaridae (Diptera).**—Ann. & Mg. Nat. Hist. 1932. Apr., May & June. Ser. 10. Vol. 9. pp. 377-405; 421-447; 501-518. With 27 figs. [Refs. in footnotes.]

The author gives a systematic review of the species of the genus *Stomoxys*, together with *Haematobia*, *Bdellolarynx*, etc. In view of the possible importance of *Stomoxys* as a vector of trypanosomiasis in several parts of Africa, this systematic work may be of value to medical men. It is clear that it will be of great service to veterinarians.

P. A. B.

LEWIS (E Aneurin). **Observations on Some Diptera and Myiasis in Kenya Colony.**—*Bull. Entom. Res* 1933 July. Vol. 24. Pt. 2. pp. 263–269. [13 refs.]

This paper comprises historical notes and preliminary observations on Diptera causing myiasis in animals and man in Kenya Colony. Wounds, ulcers and sores in natives are often infested with maggots, the responsible species recognized so far being *Chrysomya bezziana* and *Sarcophaga haemorrhoidalis*. Infestation of the healthy skin by the tumbu fly, *Cordylobia anthropophaga*, is common throughout the Colony.

V. B. Wigglesworth.

BRUMPT (E.) Les myiases chirurgicales [**Myiasis in Surgery.**]—*Bull Acad Méd* 1933 June 27 97th Year 3rd Ser. Vol 109 No. 25. pp 891–899. [15 refs.]

—Utilisation des larves de certaines mouches pour le traitement de l'ostéomyélite et de diverses affections chirurgicales chroniques. —*Ann Parasit Humaine et Comparée*. 1933 Sept. 1. Vol. 11. No. 5 pp. 403–420 With 1 text fig. & 6 figs. on 2 plates [3 pages of refs]

These papers include a history of observations on the effects of maggots in wounds, and a description of the technique for rearing and applying sterile maggots in the treatment of chronic osteomyelitis. Ambroise PARÉ in 1579 described the invasion of a head wound by maggots, but from his description, which is here printed in full, he did not recognize any beneficial action by the larvae. LARREY, during the campaign in Egypt in 1803, noted that wounds invaded by maggots healed more rapidly, and KEEN during the American Civil War (1860) actually used larvae successfully in the treatment of suppurating wounds. The beneficial effect of maggots was noted by various observers during the late war and led BAER to develop his method of treating chronic osteomyelitis by their use. Brumpt here describes in detail the method of sterilizing (with 10 per cent. formol) the eggs of *Lucilia sericata*, of rearing the larvae (in "bacto-liver") under sterile conditions, and of applying the larvae (48 hours old, 200 to 1,000 at a time) to the wound. Sometimes as many as seven applications are necessary before the entire wound is lined with healthy granulation tissue. He reports very favourably on the treatment and recommends its general adoption, but emphasizes the need for co-operation with the surgeon, particularly in the removal of sequestra which are not affected by the larvae. In spite of the obvious benefit of the larvae, the precise mechanism of their action is still uncertain; suggested factors are the presence of the proteolytic enzymes discharged by the larvae, the mechanical irritation of the spines on their bodies, and a bactericidal principle liberated by them. These questions demand further research.

V. B. Wigglesworth.

GRANTHAM-HILL (C.). **Preliminary Note on the Treatment of Infected Wounds with the Larva of *Wohlfahrtia nuba*.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. June 29. Vol. 27. No. 1 pp. 93–98. With 1 plate. [16 refs.]

Thanks largely to workers in America, it is now realized that the presence of maggots in wounds is not always harmful. It is frequently

helpful under certain conditions. The introduction of larvae of *Lucilia*, etc., into chronic wounds and ulcers has considerable therapeutic value.

The author observed that dirty superficial wounds on man and camels frequently contained maggots, and that when they did so they granulated healthily. He therefore made use of larvae born and bred aseptically for the treatment of various chronic surgical conditions. The presence of larvae stimulated a flood of exudate and was followed by the disappearance of slough and the rapid growth of granulation tissue. It was found necessary to arrange the dressings on the wound in such a way that, though the larvae were unable to escape, some light reached them. They were kept on the wound for two days, which was approximately the total duration of larval life. It is noted that the patients complained of tickling, and that larvae occasionally escaped into the beds.

We are becoming familiar with the therapeutic use of larvae of *Lucilia* and other saprophagous organisms. It is interesting to see that *Wohlfahrtia nuba* can be used in the same way, for other members of the same genus, for instance *W. magnifica* in South Russia and the Mediterranean, cause grave and often fatal myiasis. The therapeutic use of maggots is rapidly becoming common. Clinical workers would do well to familiarise themselves with the work of HOBSON,* who made full biochemical studies on the digestive enzymes of the larva of *Lucilia sericata*, and described relatively simple methods of rearing them aseptically.

P. A. B.

DUNN (Lawrence H.) Rearing the Larvae of *Dermatobia hominis* Linn., in Man.—Reprinted from *Psyche*. 1930. Vol. 37 No. 4. pp 327-342. With 1 fig. & 1 plate.

The tropical American warble-fly *Dermatobia hominis*, a parasite of cattle, monkeys and dogs in addition to man, is a frequent cause of subcutaneous myiasis in human beings, while its remarkable habit of impressing mosquitoes and other Diptera to disseminate its eggs is a curiosity of natural history. In pursuit of knowledge, the author of this paper allowed no fewer than six of the spiny larvae of this troublesome insect to grow to maturity beneath his skin. Infestation took place on October 9th, 1929, two newly hatched maggots, placed by Dunn on the flexor surface of his left forearm, soon commenced to burrow, and were completely hidden beneath the skin in 42 minutes and 1 hour 35 minutes respectively. In thus causing himself to become infested the author's action was supererogatory, since on the same day he had been naturally parasitized in the right arm and leg by four other larvae of *D. hominis*. All six larvae completed their development without change of place, the first of them to emerge did so on the 49th, the last on the 55th day following infestation. Their behaviour, and the effects of their presence upon their host are recorded from day to day. Although the invasion of four of the larvae had passed unnoticed, while that of the other two was practically painless, the

* HOBSON (R. P.) Studies on the Nutrition of Blow-fly Larvae. I. Structure and Function of the Alimentary Tract—*Jl Experim Biol.* 1931 Vol. 8 pp 109-123. II. Rôle of the Intestinal Flora in Digestion—*Ibid* 1932. Vol. 9 pp. 128-138. III. The Liquefaction of Muscle—*Ibid*. pp 359-365. IV. The Normal Rôle of Micro-organisms in Larval Growth—*Ibid* pp. 367-377. [See also this *Bulletin*, 1932, vol. 29, p. 485.]

subsequent results, which naturally varied with the age and position of the parasite, were at times much more unpleasant, ranging from "sharp itching" and "irritating pricking," to muscular contraction, profuse bleeding, lassitude, "short spells of slight fever," disturbed sleep and "attacks of excruciating pain." Serum, mixed with digested blood and pus, oozed from the warbles, and it was at all times necessary to wear bandages. Those who know the larva of *D. hominis*—a bottle-shaped maggot, surrounded by circlets of chitinous spines, and when adult often measuring practically an inch (25 mm.) in length, by 11 mm. in greatest breadth—will appreciate the author's endurance and pluck.

[Less fortunate than Dunn, Busck, who was the first to rear *D. hominis* from his own person, had perforce to accommodate the larvae for 103 days, a remarkable difference in length of development.—Cf BUSCK (A.). On the Rearing of a *Dermatobia hominis* Linnaeus.—*Proc. Ent. Soc. Wash.*, 1912. March. Vol. 14. No. 1. pp. 9–11.]

E. E. A.

DE ALMEIDA (Jayme Lins). Nouveaux agents de transmission de la Berne [*Dermatobia hominis* (L. junior, 1781)] au Brésil. [New Transmitters of *Dermatobia hominis*.]—*C. R. Soc. Biol.* 1933. Vol. 113. No. 27. pp. 1274–1275

In the course of a journey in January 1932 the author found in Juparaña, Rio de Janeiro, a specimen of *Cochliomyia macellaria* bearing on the abdomen 38 eggs of *Dermatobia*. He states that this is the first record of *Cochliomyia* acting as a carrier and gives a list of nine others capable of propagating this form of myiasis together with the names of those who made the observations and the dates. These are : *Anthomyia heideni* (Lutz and Aragão, 1917), *A. lindigii* (Lutz, 1917), *Synthesomyia nudiseta* (Lutz, 1917), *Musca domestica* (Neiva and Fl. Gomes, 1917), *Stomoxys calcitrans* (Neiva and Fl. Gomes, 1917), *Promusca* sp. (Townsend, 1922), *Sarcopromusca arcuata* (Cesar Pinto, 1928), *Neuvamyia lutzi* (C. Pinto and Fl. da Fonseca, 1930), *Pselaphophila* sp. (C. Pinto and Fl. da Fonseca, 1930), and now *Cochliomyia macellaria* (J. Lins de Almeida, 1932).

H. H. S.

CHESNEAU (Pierre) & NGUYEN-DUY-HA. Deux cas de myiase cutanée à *Chrysomya bezzianum*. [Two Cases of Cutaneous Myiasis caused by *Chrysomya bezziana*.]—*Bull. Soc. Méd.-Chirurg. Indochine*. 1933. May. Vol. 11. No. 3. pp. 306–308.

Chrysomya bezziana, a metallic bluish or greenish fly found in Africa as well as in the East, is a frequent cause of nasal myiasis in India. The cases of myiasis described occurred in Annam, one in a youth with a gunshot wound in the left hip, the other in a woman suffering from confluent smallpox. Both patients were admitted late to hospital, and died in a few days. From the wound 32 larvae, 5 to 10 mm. in length, were removed; from lesions on the face and on various parts of the body in the second case, nearly 200 similar maggots were extracted. In both instances the species was determined by ROUBAUD. Some of the larvae were bred out, and give rise to flies in from 6 to 11 days. The larval and adult characters of *C. bezziana* are given.

E. E. A.

MACKERRAS (M J) **Observations on the Life-Histories, Nutritional Requirements and Fecundity of Blowflies.**—*Bull Entom Res* 1933 Sept Vol. 24. Pt. 3. pp. 353–362. [25 refs]

Five species of blow-fly (*Calliphorinae*) have been bred and their biology studied. The author records a considerable amount of information relating to fecundity, breeding habits, and duration of life under different conditions of temperature. The principal interest of the paper is veterinary, for all the insects investigated are important in relation to the myiasis of sheep in Australia. But the work on the biology of *Lucilia sericata* is of interest to medicine, because the larvae of this insect are now used in the treatment of certain chronic surgical conditions.

P. A. B.

POTTS (W. H.). **Observations on *Glossina morsitans*, Westw., in East Africa.**—*Bull. Entom. Res.* 1933. July. Vol. 24. Pt. 2. pp. 293–300.

The laboratory observations described, relating mainly to the effect of temperature on the pupal stage, were conducted at Kikori, in Tanganyika Territory; pupae obtained in the laboratory from wild-caught flies were employed, while other series collected from natural breeding-sites were used as controls. In the laboratory larvae were usually deposited late in the afternoon or at night; on sand the newly extruded larva burrowed almost at once, and ceased to move within a quarter of an hour. An account is given of the technique of pupa-production under laboratory conditions, and also of a method of testing viability of pupae by means of immersion in methylated spirit or petrol. It was found that the duration of the pupal stage varied with the temperature, from 23.1 days at a constant 86°F. to 48.5 days when the mean temperature at noon was 70°F. Exposure for half an hour to a temperature of 45°–50°C. (113°–122°F.) was lethal to pupae.

The author uses the terms "puparium" and "pupa" as though synonymous.

E. E. A.

NASH (T. A. M.). **The Ecology of *Glossina morsitans*, Westw., and Two Possible Methods for its Destruction.—Part. II.**—*Bull Entom Res.* 1933. July. Vol. 24. Pt. 2. pp. 163–195. With 2 plates. [40 refs.]

Part I of this paper (see this *Bulletin*, 1933, Vol. 30, pp. 616–617) was devoted to ecology. The concluding portion deals with experiments in the destruction of *G. morsitans* firstly by means of insect parasites (biological control), and later by the aid of two types of traps for pupae. As before, the work was done during four and a half consecutive years, at the Kikori Entomological Station, in Tanganyika.

At Kikori the most important parasites of the pupal stage of *G. morsitans* are three species of *Thyridanthrax* (Diptera), to which belonged as much as 6 per cent. of the emergences from tsetse pupae collected locally during the period mentioned. These flies, however, cannot be bred in captivity, and are therefore useless for biological control. The Hymenopterous parasite *Syntomosphyrum glossinae*, on the other hand, can be bred without difficulty in the laboratory from blowfly pupae, in addition to being extremely prolific and possessing many other useful qualities. By means of an ingenious technique, between December, 1930, and May, 1932, some twenty-three million

S. glossinae were liberated in tsetse breeding-places, but results, unfortunately were disappointing. By July, 1932, probably owing to "the inability of *S. glossinae* to penetrate sandy soils" in order to reach the tsetse pupae, "the parasites had made but little advance towards establishing themselves within the area" The author hopes ultimately to make a further trial "in an area where tsetse breed solely in humus"

In the Kikori fly-belt *G. morsitans* deposits its larvae either beneath outcropping slabs of rock, or under fallen trees. Conspicuous artificial breeding-places made of boards entirely failed to compete with the natural rock sites. Much more promising results were obtained by felling trees to form log traps for pupae, as was done by LAMBORN in Nyasaland, in 1916. Trees selected for this purpose should have straight trunks, with a mean girth of 45 inches; after felling, branches forming the crown, as also grass beneath the trunk, must be removed, and the underlying earth broken up into a loose bed; a straight branch, to form a roller, is placed beneath each end of the log and at right angles to it, thus raising it a few inches off the ground and permitting it to be rolled with ease. The attractiveness of such a trap is increased by pegging bark, or placing slabs of rock, at intervals along the sides. The humus formed beneath a decaying tree has no special attraction. Although the natural breeding-sites were not destroyed, the log trap proved "vastly superior" to rock sites, some of which were even deserted in its favour, while log sites frequently yielded fewer pupae than the trap. If paid sixpence a day, four boys in that time can construct eight new log traps at a cost of threepence apiece; but, by means of a roller placed under each end, a natural log site can be converted into a trap at the cost of one penny.

A temperature of about 112°F. is fatal to *G. morsitans* pupae, all of which, "down to a depth of at least one-and-a-half-inches," can be destroyed during the dry season by exposing breeding-sites to the mid-day sun, for this purpose traps are rolled every twenty-eight days in the hot-weather, and every forty days while the latter is cooler and the pupal period longer. Although a final test has yet to be made, it is considered that extensive use of log traps in small *G. morsitans* areas may greatly reduce and possibly exterminate the fly. E. E. A.

LLOYD (Ll.), LESTER (H. M. O), TAYLOR (A. W) & THORNEWILL (A. S.).

Experiments in the Control of Tsetse Fly. Part II.—*Bull. Entom. Res.* 1933. July. Vol. 24. Pt. 2. pp. 233–251. With 2 figs. & 2 maps.

In continuation of previous reports on the work of the Tsetse Investigation in Northern Nigeria (see this *Bulletin*, Vol. 20, p. 794; Vol. 21, p. 760; Vol. 22, p. 290; Vol. 24, p. 891; Vol. 26, p. 259; Vol. 27, p. 520), an account is given of what was done between May 1926 and the end of October 1929, when field operations were replaced by laboratory research. Work was continued in the Sherifuri experimental area, some "72 square miles of country, with about 75 miles of meandering watercourses," where the tsetse are *Glossina morsitans* and *G. tachinoides*, and was also carried out in Matyoro, a chain of swamps and lakes in a depression 150 square miles in extent, 110 miles south-east of Sherifuri. In the Matyoro area *G. palpalis* occurs besides the two species already mentioned.

It was endeavoured in both areas "to control tsetse by the destruction of primary and secondary foci by the clearing of all fringing forest,

the general woodland being left untouched." Re-growth after clearing was very active during the first year, but in view of its subsequent diminution re-slashing every third year may suffice. Creepers and grasses, which invade clearings, become so matted as to hinder growth from stumps, and to prevent tsetse from seeing. In the Sherifuri area, after clearings had been made, weekly catches of tsetse in certain foci enabled specific points to be noted. In the case of *G. morsitans*, the wet season extension remained unaffected after the fringing forest had been cleared for 800 yards from the collecting centre, but four miles of similar clearing reduced the extension by five-sixths. *G. tachnoides* was much more severely affected by clearing, and practically failed to spread from a distance of 800 yards and upwards. Fencing half a square mile of country so as to exclude game had practically no adverse effect upon *G. tachnoides*, which is capable of feeding largely upon non-mammalian blood, but the *G. morsitans* caught were immigrants from neighbouring foci, and "were starving inside the fence."

In the Matyoro area, where there is running water throughout the year, the vegetation is subtropical and evergreen, and both *G. tachnoides* and *G. morsitans*, while freely attacking baboons, feed mainly upon the abundant game. Crocodiles and monitor lizards furnish part of the food supply of *G. palpalis*, and also, to a smaller degree, of *G. tachnoides*. In spite of plentiful water, and the "potential" grazing thus afforded, the hordes of tsetse caused the area to be entirely uninhabited. "In order to open up the district for settlement and to make its water supply and grazing accessible to cattle, six and a half miles of the valley have been cleared, the fringing forest and its adjacent heavy woodland savannah both being cut. Groups of settlers have since come in and it is hoped that in time these will be sufficiently numerous to colonise all the available land."

Although four experiments in late grass burning in the Sherifuri area destroyed adults and pupae of *G. morsitans* and *G. tachnoides* in large numbers, it is considered that "the net results do not justify the expense and difficulties which fire protection involves in this country."

E. E. A.

CHORLEY (C. W.). **Traps for Tsetse-Flies of the "Crinoline" and "Ventilator" Forms. With a Prefatory Note by C. F. M. SWYNNERTON.**—*Bull. Entom. Res.* 1933. July. Vol. 24. Pt. 2. pp. 315–318. With 1 text fig. & 1 plate.

The exceedingly cheap and simple traps described and illustrated in this preliminary account have proved effective against *Glossina palpalis*, and their natural attraction is to be enhanced by the addition of a suitable animal scent, if such can be made readily available. Essentially they consist of a "non-return" cage, from which depends a skirt or cylinder of khaki cloth or other fabric, or of cloth-covered or painted wood or tin, kept wide open at the bottom for the admission of inquisitive flies. If appropriately suspended, with its entrance from four inches to a foot from the ground, and fitted with wind-scoops (made from petrol tins), such a trap revolves in the wind, and thus advertises itself.

SWYNNERTON, whose account of some of his own traps for the taking of tsetse-flies was recently noticed [Vol. 30, p. 618], testifies to the worth of Chorley's contrivances in the case of the species mentioned.

E. E. A.

CARMICHAEL (J.). **The Virus of Rinderpest and its Relation to *Glossina morsitans*, Westw.**—*Bull. Entom. Res.* 1933 Sept. Vol. 24. Pt. 3. pp. 337-342.

No satisfactory explanation has yet been discovered to account for the remarkable disappearance of *G. morsitans* from the Eastern Transvaal, parts of Rhodesia and elsewhere, following outbreaks of rinderpest commencing with the great epizootic among the wild fauna in 1896. The fact that (in the Transvaal and Rhodesia) although certain kinds of big game, such as the buffalo, suffered what amounted to local extinction, all species were not affected to the same extent, has led to the belief expressed from time to time that the virus of rinderpest, imbibed with blood from diseased animals, may prove as fatal to the fly as to the ungulates themselves. In order to determine the effect of the virus of rinderpest on *G. morsitans*, Carmichael, working in Uganda, has carried out a series of controlled experiments, the results of which failed to furnish "any evidence that rinderpest virus, as it exists in the peripheral blood of infected animals, in any way affects *Glossina morsitans*, either directly or from the point of view of reproduction."

E. E. A.

MELLANBY (Kenneth). **The Influence of Temperature and Humidity on the Pupation of *Xenopsylla cheopis*.**—*Bull. Entom. Res.* 1933. July. Vol. 24. Pt. 2. pp. 197-202. With 2 figs.

The larva of *Xenopsylla cheopis* is easily killed by dry air; the adult is relatively resistant. This paper describes the effects of temperature and humidity on this flea during the period of metamorphosis. The pupa, like the adult, is resistant to dry air; the larva and prepupa (pupating larva) are not resistant, and the cocoon is no protection against the dryness. *X. cheopis* can complete its life cycle between 18°C. and 35°C. provided the air is moist, but at a relative humidity of 40 per cent. the larva dies before pupation can take place.

V. B. Wigglesworth.

PASQUAL (Jas. Hilton). **A Simple Remedy against Jiggers.** [Correspondence.]—*West African Med. Jl.* 1933. July. Vol. 7. No. 1. p. 89.

The author writing from Mamfe, Cameroons, states that a mixture of salicylic acid, 1 part, ichthyol 4 parts, vaseline 4 parts, rubbed over the feet and between the toes not only repels jiggers but expels the newly established flea. It should be re-applied every three days unless removed during the daily bath. It appears that jiggers are very thick in the rest houses of Mamfe.

A. G. B.

JANISCH (E.). **Beobachtungen bei der Aufzucht von Bettwanzen. 1. Ueber das Verhalten von Populationen bei verschiedenen Zuchtbedingungen. [Studies on the Breeding of Bed-bugs. 1. The Influence of Various Conditions upon Populations.]**—*Ztschr. f. Parasitenk.* 1933. May. Vol. 5. No. 3/4. pp. 460-514. With 23 figs. [15 refs.]

Cultures of bed-bugs (*Cimex lectularius*) were kept under standard conditions of temperature and humidity, fed daily on man or guinea-pig, and bred for many generations. They were kept at 27°, 32° and

34°C., in each case with a relative humidity of 75 per cent. Batches of eggs and larvae were exposed to unfavourable conditions—a temperature of 40°C. for 24 hours—and breeding continued using this stock. Many careful observations are recorded, showing the time required for each stage in the life-history of the bugs. The mortality of all the pre-imaginal stages is recorded, and the length of adult life. Great variations are found in all cases, not only between different cultures, but also within one culture all individuals of which have had similar treatment. This variability makes it difficult to interpret all the results, and some of the author's conclusions require confirmation, particularly those dealing with the effects which injuries of eggs and larvae have on adult longevity and upon egg-production, since only small numbers were used in these experiments. The results appear to show a marked connexion between the treatment of parent bugs and the behaviour of their offspring. If the parents were subjected to unfavourable conditions, not only did they lay fewer eggs, but many of those eggs were sterile, and there was a high pre-imaginal death rate. Under optimum conditions, the time taken by each stage is much more uniform than under less favourable conditions, and the more favourable the conditions during pre-imaginal life, the longer is imaginal life likely to be. This implies that conditions which are not optimal can do some slight damage to the system of the bugs, which is not fatal, but which impairs their vitality permanently. Calculations are made which show the extent of damage mathematically.

K. Mellanby.

HASE (Albrecht). Zur Fortpflanzungsphysiologie der blutsaugendn Wanze *Rhodnius pictipes* (Hemipt. Heteropt.). Beiträge euz experimentellen Parasitologie. 9. [Physiology of Reproduction of *Rhodnius pictipes*.]—*Ztschr. f. Parasitenk.* 1933 Sept. 6. Vol. 6. No. 1. pp. 129–144. With 5 text figs.

The author has collected in South America and has a knowledge of *Rhodnius pictipes* both in nature and in the laboratory. He points out the great contrast that there is in its behaviour. In its own country it flies and runs with great rapidity, entering houses and biting man, but in captivity it is always most sluggish. The paper describes methods of rearing this insect and gives a considerable body of fact relating to the number of eggs that are laid and to the period passed in the egg at different temperatures. If a group of eggs is kept under identical conditions of temperature and humidity, the hatching is often spread over many days. The author finds that several causes combine to produce mortality in the egg stage, and that the effect on them is different at different temperatures. [It is curious that biologists very seldom pay heed to the causes of death and the times in the life cycle at which mortality occurs.] In general the biology of this insect resembles that of *R. prolixus*.

P. A. B.

JELLISON (Wm. L.) & PHILIP (C. B.). Technique for Routine and Experimental Feeding of Certain Ixodid Ticks on Guinea Pigs and Rabbits.—*Public Health Rep* 1933. Sept. 1. Vol. 48. No. 35. pp. 1081–1082. With 2 plates.

In this method the ticks are held to the surface of the animal in tin capsules made from the threaded end rings and covers used on cardboard postal tubes. These parts can be obtained, from the makers,

separate from the tubes. The end ring is inserted in a hole in a band of adhesive strapping and held in place by cutting the lower margin to form a flange, which is then covered by another strip of plaster with a hole in it. The animal is clipped, and the band of strapping fastened round it. The ticks are placed in the capsule and retained by screwing on the lid. Ventilation may be provided by punching a hole in the screw top and soldering in a piece of wire gauze.

V. B. Wigglesworth.

DUNN (Lawrence H.). **Observations on the Host Selection of *Ornithodoros talaje* Guern., in Panama.**—*Amer. Jl. Trop. Med.* 1933 Sept. Vol. 13. No. 5. pp 475-483.

It has been shown previously that *Ornithodoros talaje* takes the blood of man and rat; that it is partly responsible for the transmission of human relapsing fever in Tropical America; and that the causal organism of this disease can be found in the blood of many animals in Panama.

The author shows that this tick is not a common parasite of man in Panama and that when it occurs in houses, it is generally parasitic on rats. On those animals the larvae of this tick can frequently be found, and he has also found them on dogs, cats and chickens. An extensive investigation of wild monkeys of many sorts showed that larvae were very seldom found upon them. In contrast to these findings, *Ornithodoros venezuelensis*, which has frequently been confused with *talaje*, is a normal parasite of human beings.

P. A. B.

MURASHIMA (Tetsuo). **Prevalence of House Ticks in Kanagawa Prefecture and their Destruction.**—*Jl. Public Health Assoc. Japan.* 1933. Aug. Vol. 9. No. 8. pp. 1-4.

The mite *Liponyssus nagayoi* is believed by the author to have been introduced into Japan by ships from foreign ports, either in cargoes or on rats, and in March, 1926, a passenger steamer, plying between Manila and Yokohama was found to be extensively infested. On arrival at Yokohama, disinfection was successfully performed by fumigation with chloropicrin. In Japan itself the mite was first discovered in Yokohama in May of the same year, and by 1931-32 practically all parts of the city had become infested; after Yokohama, the mite is most prevalent in the neighbouring cities of Yokosuka and Kawasaki. *L. nagayoi*, which seems always to be associated with rats, breeds in damp, ill-lighted and badly ventilated places in houses, its numbers increasing as the weather grows warmer. It chiefly attacks the lower abdomen and thighs, and severe cases result in local oedema and itching, followed by scratching on the part of the victims and the formation of scabs. Women apparently are more commonly attacked than men. Measures against *L. nagayoi* include the destruction of rats and their nests, and the use of either crude cresol, carbon tetrachloride or paradichlorobenzene, mixed in each case with gasoline. Fumigation with chloropicrin is impracticable in Japanese houses.

[According to FINNEGAN, there is reason to think that *L. nagayoi* Yamada, is identical with *L. bacoti* Hirst, a species which, originally found in Egypt, has since become widely distributed and, besides occurring in China and America, has been met with on several occasions in London.]

E. E. A.

INGRAM (W Wilson) & MUSGRAVE (Anthony). **Spider Bite (Arachnidism): a Survey of its Occurrence in Australia, with Case Histories.**—*Med. Jl Australia*. 1933 July 1. 20th Year. Vol. 2. No. 1. pp. 10-15. With 4 figs. (3 coloured on 1 plate). [52 refs.]

Spider bite has been responsible for seven recorded deaths in New South Wales during the past five years. Three species of spider are known to be harmful to man in Australia: the "funnel web" spiders, *Atrax robustus* and *A. formidabilis* which belong to the Mygalomorphae and spin funnel-shaped retreats but do not construct snares, and the "red back," *Lathrodectus hasseltii*, which belongs to the typical snare-making spiders, the Arachnomorphae. Descriptions and coloured illustrations of these Arthropods are given, their habits are described, and a number of cases recorded in full to show the characteristic effects of their bites. The bites of *Atrax* appear to be the more serious. Neither the pain nor the local symptoms are usually great, but neurotoxic symptoms of all kinds are liable to occur and death very commonly results, all the persons bitten have been desperately ill. The bites are usually contracted out of doors and at night. The bites of *Lathrodectus* are most commonly inflicted on the genitals during the use of outdoor closets. The pain develops slowly but is generally extremely severe. Nervous symptoms are not so marked as with *Atrax* bites, and death is less frequent (6 per cent of recorded cases in Australia). Treatment with convalescent serum has given promising results; otherwise treatment is symptomatic. Recovery often takes place quite suddenly in patients extremely ill. *V B. Wigglesworth.*

WALSH (Groesbeck) & MORGAN (William G). **Arachnidism: Report of a Series of 29 Cases of Poisoning from the Bite of the *Latrodectus mactans***—*Amer Jl. Med. Sci.* 1933. Sept. Vol 186. No. 3. pp. 413-418.

Poisoning from the bite of *Lathrodectus mactans*, the "black widow" spider, is widely spread throughout the United States. Although it is true that most cases are contracted during the use of outdoor privies, this is not always the case, and where this history is not obtained there is considerable risk that the symptoms may be mistaken for those of an acute intra-abdominal lesion. Cases illustrating this are described. The most valuable point in differential diagnosis of spider bite is the rigidity of other large muscular masses, such as those of the thigh and lumbar region, besides those of the abdomen. *V. B. Wigglesworth.*

MATHIS (C) & BERLAND (L). Une araignée domestique africaine, *Plexippus paykulli*, ennemie naturelle des *Stegomyia*, hôtes des maisons [A Domestic African Spider which preys on *Aedes*.]—*C. R. Acad. Sci.* 1933. July 17. Vol. 197. No. 3. pp. 271-272.

Plexippus paykulli, at one time known as *Salticus culicivorus*, is a domestic hunting spider common throughout the tropics. In Dakar it was observed to prey largely upon adults of *Aedes aegypti* while these are at rest in dark corners, and it is suggested that it may be a factor of some importance in controlling this species in the adult stage.

V. B. Wigglesworth,

PASHA (Djamal Faik Tutunji) **A Spider-Bite Successfully Treated with Antiscorpion Serum.**—*Folia Medicinæ Internæ Orientalia*. Jerusalem. 1933 May. Vol 1 No. 2 pp. 233-234.

"A case of a bite by a venomous black spider (called 'Akis' by the natives of Transjordan) which is believed to be always fatal, is reported. Symptomatic treatment was of no benefit and the patient was almost dying. But a superstition amongst the natives that the 'Akis' borrowed its venom from the scorpion, suggested the trial of antiscorpion serum injection. The result was marvellous and the patient had a narrow escape from death."

A. G. B.

TANON & NEVEU (R.). Sur la présence à Paris de la "*Supella supellectilium*." [On the Occurrence of *Supella supellectilium* in Paris.]—*Rev. Méd. et Hyg. Trop.* 1933. May-June. Vol. 25. No. 3. pp. 148-150.

Supella supellectilium, a small brownish cockroach of which the name is badly mangled in the French title of this paper, was found in 1933 to have established itself in a centrally heated block of flats in Paris; and the fact that the insects first made their appearance in rooms previously occupied by a family of Syrians is sufficient explanation of the phenomenon. For in this era of rapid transit *S. supellectilium*, which occurs throughout the warmer parts of the world, may easily be transported alive in personal baggage. A mixture of sodium fluoride and pyrethrum powder, which is among the remedies suggested, should have had the desired effect.

The authors are in error in stating that this insect has not hitherto been met with in France; its occurrence at Draguignan is on record, and it has also been discovered on two occasions in England.

E. E. A.

BARRAUD (P. J.). Additional Records of the Distribution of Anopheline Mosquitoes in India (from January 1, 1931 to April 15, 1933).—*Records of the Malaria Survey of India*. 1933. June Vol. 3. No. 3. pp. 507-525.

DE BENEDETTI (Augusto) Di un metodo per rendere praticamente insommergebili le polveri menstrui per lo spandimento del verde di Parigi. (A Method for making Dust Menstrua Insubmergeable for Paris Greening).—*Riv. di Malariologia*. 1933. Jan.-Feb. Vol. 12. No. 1. pp. 92-97. English summary p. 259.

BISHOPP (F. C.), CORY (E. N.) & STONE (Alan). Preliminary Results of a Mosquito Survey in the Chesapeake Bay Section.—Reprinted from *Proc. Entom. Soc. Washington*. 1933. Jan. Vol. 35. No. 1. 6 pp.

EWING (H. E.). Three New Chigger Mites of the Genus *Trombicula* from Panama, with a Key to the Known Adults of *Trombicula* of the New World.—*Proc. U. S. Nat. Museum*. Washington. 1933. Vol. 82. Art. 29. 6 pp. With 3 figs.

HINMAN (E. Harold). Hereditary Transmission of Infections through Arthropods.—*Amer. J. Trop. Med.* 1933. July. Vol. 13. No. 4. pp. 415-423. [27 refs.]

LEVER (R. J. A. W.). Status of Economic Entomology in the British Solomon Islands.—*Bull. Entom. Res.* 1933. July Vol. 24. Pt. 2 pp. 253-256. [10 refs.] Contains a note on malaria and filariasis.

- MARTINI (E) The Hypopygia of Certain Anophelines (Diptera · Culicidae) — Reprinted from *Proc. Entom Soc Washington* 1933 May Vol 35. No 5 pp 61-67 With 3 figs [13 refs.]
- PALADINO-BLANDINI (A.). Ordinamento e primi risultati della lotta anti-anofelica generale in Calabria (Organisation and First Results of the General Campaign for the Destruction of Anopheles in Calabria) — *Riv. di Malariaologia* 1933 Jan-Feb Vol 12 No 1 pp 118-195 With 31 figs English summary p 260
- RODRIGUEZ (Josué) Intoxicaciones por el veneno de las arañas — *Prensa Méd. Argentina* 1933. July 5 Vol 20 No 27 pp 1490-1496
- URCHS (O) Anopheles-Brutplätze und Schatten Bemerkung zu der Arbeit von L. Kalandadse *Archiv für Schiffs- und Tropen-Hygiene*, Bd 37, Heft 2, Februar 1933 — *Arch f Schiffs- u Trop-Hyg* 1933 Aug Vol 37 No 8 pp. 391-392
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REVIEWS AND NOTICES.

CHRISTOPHERS (S. R.) [Kt, C.I.E., O.B.E., F.R.S., I.M.S. (retd.)]. **The Fauna of British India, including Ceylon and Burma. Diptera. Vol. IV. Family Culicidae. Tribe Anophelini.**—pp. vi+371. With 53 figs. & 3 plates. Published under the Authority of the Secretary of State for India in Council. Edited by Lt-Col. R. B. S. SEWELL, C.I.E., Sc.D., I.M.S., assisted by F. W. EDWARDS, M.A., Sc.D. 1933. Oct. London: Taylor and Francis, Red Lion Court, Fleet Street.

The distinguished group of malarialogists who work in India have made great contributions to our general understanding of *Anopheles*. They have produced comprehensive papers on the structure of eggs and larvae, on the systematics of certain difficult groups, and on the relation between different species as revealed by structures in the hypopygium and pharynx. Work of this nature is associated with the names of Christophers, BARRAUD, PURI, SINTON, COVELL and others. The senior member of the team has now produced a book which gives a careful summary of all that is known about the species of *Anopheles* which occur in India. As is only natural in a volume on "The Fauna of British India," the outlook is in the main morphological rather than biological. One may sum up the book by saying that without question the Indian species of this genus are now much better known than any other group of Indian insects. It might be added that it is unlikely that further work will result in great advances in knowledge, at any rate along anatomical lines.

The introduction is very full and contains much matter of general interest. The author discusses the classification of the insects and shows that the subdivisions of the genus *Anopheles* which were suggested by himself in 1915 and 1924 are supported by more recent work on the structure of the pharynx and the chaetotaxy of the larvae and pupae. It is a matter of some interest that when the external anatomy of adults and early stages have been examined so exhaustively, they should lead to the same general taxonomic conclusions. The author then passes to a discussion of geographical distribution, first in the world, and then in the Oriental region. The boundary between the Oriental and Australasian regions does not coincide with "Wallace's Line" but is considerably further to the east. Within the Indian area, the change in Anopheline fauna from east to west is gradual and is perhaps more due to rainfall than to any other factor. About three-quarters of the total Indian species have a wide Oriental distribution, and none of these extend to the countries to the west of India. But there is also a considerable Mediterranean element in the fauna, particularly in northern and western India. It is a little difficult to grasp the reasons for which some of the species are assigned to certain zoogeographical elements. For instance, *Anopheles stephensi* is regarded as "Indian" and not "Oriental," but it ranges eastwards through the Malay States and the East Indies and westwards to Southern Mesopotamia. But the assignation of species to zoogeographical groups is always a matter of personal opinion. The section which deals with bionomics gives a brief review of breeding places and habits of adult and larva. There is also a single page on "terrain, season, and other influences"; some further information on such matters is given under individual species later in the book. The section includes a tabular statement in which

the different types of breeding place are distinguished and the characteristic species shown under each. It may be hoped that this admirable systematic and morphological book will furnish a base for much accurate work on the seasonal distribution, hibernation and relation to different types of water of the Anopheline fauna.

The author then passes to a discussion of the relation of different species of *Anopheles* to malaria. In his view there are five species which are important wherever they are found: *culicifacies*, *stephensi*, *minimus*, *fluviatilis* and *sundarcus*. Others are important in parts of India, or may occasionally carry malaria. One would welcome rather more detailed information on this subject, for instance, I believe that large numbers of wild *A. subpictus* have been dissected in different places and at different seasons with negative results. It would surely be of interest to give the figures, but both in the introduction and in the text which deals with that species, only a general reference to that work is made. The introduction concludes with precise notes on methods of collecting, mounting, dissecting, etc. the author includes an invaluable list of the equipment which should be taken on a collecting expedition.

The systematic part of the work, which runs from page 95 to 315, deals with 43 species and a number of varieties. The following synonyms, among others, should be noted: for *fuliginosus*, *annularis*; for *listoni*, *fluviatilis*; for *ludlowi* var. *sundarcus*, *sundaicus*; for *rhodesiensis*, *d'thali*; for *rossi*, *subpictus*; for *sinensis*, *hyrcanus* var. *ingerrimus*. Keys are given for identifying adults, full-grown larvae and eggs. It is clearly impossible to summarize or discuss systematic work except in a general way, but may we express regret that the author employs so many gradings of less than generic value. He puts all the Indian species in the genus *Anopheles*, which he subdivides into subgenera, groups and series. Some of the names are used in two special senses: for instance, the subgenus *Myzomyia* contains several groups, one of which is also called *Myzomyia*. We cannot believe that so elaborate a machinery is necessary for classifying such a small number of species, for there are but 43 species of Indian *Anopheles* and only about 160 in the world. This military system, with many ranks, is not to be found in any standard work elsewhere in systematic entomology, and your ignorant reviewer finds himself confused by a mass of names. For instance, when he sees a page headed "Group *Paramyzomyia*," it gives him no help and he has to turn back until he chances on the name of some species. But this elaboration in classification is no new thing in Indian malariology, and clearly no protest that is made can be availing.

Everyone who has to deal with *Anopheles* from any part of the Oriental region will be deeply grateful to Sir Rickard Christophers for crowning his labours in India by this comprehensive and invaluable summary. The only criticisms that could be made relate to matters of detail, and India now has a general account of her species of *Anopheles* which is of greater value and produced in a more scholarly way than any other book of a similar nature. P. A. Buxton.

KHARTOUM. The Kitchener School of Medicine. Fourth Report, 1931-1932.—77 pp. With 5 plates. [No date or place of publication.]

The following are the principal features.—

The objective is to train Sudanese natives to replace doctors, apparently chiefly of Syrian nationality, recruited outside the Sudan. The course is

comparable to that of Great Britain, but is of four years duration only, instead of five. The shortening is accomplished by compressing the time devoted to Anatomy and Physiology into a single year, teaching sufficient only to form a scientific basis for subsequent instruction in purely professional subjects. A further year is spent compulsorily as house-officer at one of the larger hospitals. It is the intention eventually to lengthen the course to five years, to institute postgraduate courses, and to select some experienced and promising graduates to be trained as bacteriologists for routine laboratory duties and possibly for research investigations also.

The standard attained in the final examination closely approaches that of the Conjoint Board of the London Colleges. The assessors at this examination are men of distinction in Egypt and Great Britain and their reports are full and comprehensive.

Great care is taken in the selection of candidates for entry to the school. All come from the Gordon College, and attention is given not only to mental capacity but also to character and personality.

All instruction is carried out by Government officers. Tutors of the Gordon College teach the Preliminary Sciences and members of the Staff of the Khartoum Hospitals and Health Department are responsible for the professional subjects. There is one officer, the Registrar, whose whole time is devoted to the school, teaching Anatomy and Physiology, and undertaking general management and supervision. It is worthy of note that he receives an adequate allowance beyond his pay for services which demand special qualifications, enthusiasm and devotion, an observation which applies also to the allowances which all lecturers receive.

Both as regards capital and recurrent expenditure the school has required no very heavy financial assistance from Government. Most of the money has been derived from grants from charitable funds and subscriptions from commercial companies and private individuals, natives of the Sudan even having contributed generously. This is an example which might commend itself to other countries, though the Sudan has the advantage of such illustrious names as Gordon and Kitchener to attract public interest.

The report shows that the school is an established success and that its products are making good. Many difficulties must have been encountered; one specially stressed is that concerning the teaching of Midwifery, it being customary in the Sudan as in all Mahommedan countries for women to be strictly secluded and in consequence to be reluctant to submit to examination by men. It is most satisfactory to observe that this difficulty is being surmounted.

It is suggested that subsequent reports might assist the uninformed reader to appreciate the aims, methods and results of medical education if a few brief additions were made. Such additions might take the following form:—

(a) A short account of the activities of the Khartoum Civil Hospital, indicating the extent and scope of its practice, thus demonstrating its ability to furnish appropriate clinical material.

(b) Some idea of the medical organization of the country with the object of showing the rôle the products of the school are intended to play in this organization.

(c) Questions set at examinations with selected answers to give some indication of the quality of the English and the standard of knowledge attained.

H. B. Owen.

BUREAU OF HYGIENE AND TROPICAL DISEASES.

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[No. 2.

YELLOW FEVER.

SOPER (F. L.), PENNA (H.), CARDOSO (E.), SERAFIM (J.), Jr., FROBISHER (M.), Jr. & PINHEIRO (J.). **Yellow Fever without *Aedes aegypti*. Study of a Rural Epidemic in the Valle do Chanaan, Espirito Santo, Brazil, 1932.**—*Amer. Jl. Hyg.* 1933. Nov Vol. 18. No. 3. pp 555-587 With 4 maps. [18 refs.]

A detailed account of an epidemic of yellow fever, which lasted for at least 3 months, in a district in which *Aedes aegypti* was not found even after a prolonged search begun 6 weeks before the apparently spontaneous disappearance of the outbreak.

Yellow fever has long been considered as an essentially urban disease ; consequently the occurrence of a strictly rural epidemic, occurring in the valley of Chanaan, Espirito Santo, Brazil, from January to April, 1932, is of interest. No cases of the disease had been recorded from this State since a sharp outbreak in Victoria during 1917 and 1918. Nevertheless the Municipio of Santa Thereza, of which the Valle do Chanaan is a part, had been a suspected area, owing to the absence of any obvious cases of yellow fever during 1928 to 1931, when it was known to be present in the neighbouring State. Santa Thereza was inspected, but the absence of *Aedes aegypti* led to its being struck off the list of suspected localities. However a fatal case of yellow fever, in which the diagnosis was confirmed by postmortem examination, led to field investigations, and the existence of the disease in the valley was confirmed by further autopsies and by animal inoculations. A total of 83 suspected cases with 9 deaths occurred in three months, widely scattered over a rural district of about 20 square miles. Out of 412 blood specimens collected in the suspected area, 62 sera protected, a low percentage in view of the epidemic and rumours of previous invasion in the valley. The spontaneous disappearance of the disease is attributed to the inefficiency of the insect vector, rather than to failure of the human host.

In spite of a very careful entomological survey no specimens of *Aedes aegypti* were found, but various other species of mosquitoes which have been incriminated by laboratory experiments were present, although only *Aedes scapularis* and *A. fluviatilis* in sufficient numbers to be considered responsible for the epidemic. *A. scapularis* was found the more frequently and is believed to be the more dangerous species.

E. Hindle.

SOPER (Fred L.) & DE ANDRADE (Alvaro). **Studies of the Distribution of Immunity to Yellow Fever in Brazil. II. The Disproportion between Immunity Distribution as revealed by Complement-Fixation and Mouse-Protection Tests and History of Yellow Fever Attack at Cambucy, Rio de Janeiro.**—*Amer. Jl. Hyg.* 1933. Nov. Vol. 18. No. 3. pp. 588-617. With 3 charts.

An interesting epidemiological survey in Cambucy, Brazil, during and after a small epidemic in this previously endemic area, based on history of illness, complement fixation and mouse protection tests. The results indicated that the distribution of immunity bore very little relationship to the recognition of typical cases of the disease, but was highly correlated with recent cases of so-called "grippe" without respiratory symptoms.

Cambucy is a small town with a population of less than 1,000, on the Parahyba River in the State of Rio de Janeiro. From 1908 to 1928 no cases of yellow fever had been recorded from the whole State, but then the epidemics of 1928 and 1929 were followed by isolated outbreaks and between November, 1930, and February, 1931, there were 13 clinical cases with 5 deaths in Cambucy. In addition, however, there was a widespread epidemic of a relatively mild type, characterized by fever, headache, and body pains, and to a lesser extent by nausea, vomiting, and icterus. Out of a population of 823, the number of these cases was 227, the majority of them occurring in December (63) and January (98). An examination of the sera of 555 persons by mouse protection tests gave approximately 60 per cent positives. Complement fixation tests with these sera collected either at the end of the epidemic or 8 months later gave positive percentages of approximately 20 and 13 respectively, so there is evidently a rapid loss of complement fixing bodies. Similar tests with the sera of persons with a history of recent illness gave approximately 90 per cent. positive with the mouse protection test, compared with about 47 per cent. positive in persons without such history. A considerable number of these latter, however, even in the younger age groups, were found to be immune, indicating that immunization may often occur without illness sufficiently severe to be remembered.

In the case of complement fixation tests the percentage of positive results was significantly higher 6 to 10 weeks after an attack than either before or after this time.

"The results of this study indicate that epidemiological investigations unsupported by laboratory tests and autopsies, are bound to be falsely comforting in endemic yellow fever areas in which there is little movement of foreigners." E. H.

MAHAFFY (Alexander F.), LLOYD (Wray) & PENNA (H. A.). **Two Years' Experience with the Intraperitoneal Protection Test in Mice in Epidemiological Studies of Yellow Fever.**—*Amer. Jl. Hyg.* 1933. Nov. Vol. 18. No. 3. pp. 618-628.

The authors give valuable practical details for the application of the intraperitoneal protection test in mice and then analyse the results of the examination of 3,274 sera.

The analysis of these 3,274 specimens shows that only 111 (3.4 per cent.) gave inconclusive results. Of these 77 were tested a second time and 28 were positive, 24 negative, and 25 remained inconclusive. In the normal serum control, the number of mice used was 1,069 of

which 77 (7.2 per cent.) survived. Using this test the incidence of immune protecting bodies in the sera of persons in certain areas of Brazil and West Africa shows 61 and 72 per cent. positive in regions visited by recent epidemics compared with completely negative results from regions never infected with yellow fever. These findings are in close agreement with the results of protection tests in *rhesus* monkeys, with sera from the same two infected areas—respectively 55.3 per cent. and 68 per cent. positive.

The ease with which the intraperitoneal protection test in mice can be applied to field studies on a large scale and its reliability make it of practical as well as of theoretical value in epidemiological studies of yellow fever. *E H.*

PETTIT (Auguste) & STEFANOPOULO (Georges J.). Utilisation du sérum antiamaril d'origine animale pour la vaccination de l'homme. [The Use of Animal Anti-Yellow Fever Serum for Human Vaccination.]—*Bull. Acad. Méd.* 1933. July 18. 97th Year 3rd Ser. Vol. 110. No. 28. pp. 67–76. [27 refs.]

The authors have prepared anti-yellow fever serum in 4 horses and 13 large monkeys, including one chimpanzee and 12 baboons, by repeated injections of yellow fever virus. With one exception all the baboons produced efficient antisera, but of the 4 horses only two furnished a sufficiently high titre, the best serum being obtained from a young individual. The action of these animal sera in preventing infection in *Macacus rhesus* is very marked, for monkeys inoculated with immune serum, either baboon or horse, up to four days after receiving an injection of the virus, failed to become infected.

Specimens of antisera were tested in mice by Drs SAWYER and WHITMAN in New York, and the results of their tests are given in tabular form. It is evident that the majority of these antisera contain a high titre of antibodies and might well replace human convalescent serum in the virus-immune serum method of vaccination. *E H.*

LAIGRET (J.). Recherches expérimentales sur la fièvre jaune (troisième mémoire). Technique pour la préparation des vaccins amarils, vaccins glycérinés et vaccins secs. [Experimental Studies on Yellow Fever. Technique for the Preparation of Glycerinated and Dry Yellow Fever Vaccines.]—*Arch. Inst. Pasteur de Tunis.* 1933. Aug. Vol. 22. No. 2 pp. 198–204.

The author has prepared both dry and glycerinated yellow fever vaccines from the brains of mice infected with neurotropic yellow fever virus.

Glycerine suspensions of the infected brains were exposed, in the dark, to room temperatures for periods of one, two, three and four days, respectively, and then kept in the refrigerator at about -15°C . The suspensions were then tested for virulence by diluting them with saline solution and inoculating various dilutions into mice. When dilutions of 1/10,000 are fatal the vaccine is too virulent for use; dilutions of 1/100 to 1/1,000 producing fatal infections can be used for the third vaccination; those of 1/100 or less for the second vaccination, and the vaccine producing no fatal infections in mice is used for the first vaccination. These three inoculations are given at intervals of 20 days in the order indicated above, each comprising 1 cc. of a 1/100 dilution of the attenuated virus.

Dry vaccines are prepared by attenuating the whole mouse brain in glycerine at room temperature, in the same way as suspensions. After attenuation each brain is ground up with 1.5 gm. of a sterile mixture of 20 parts Na_2HPO_4 and 3 parts of KH_2PO_4 . The ground up material is then dried *in vacuo* over sulphuric acid for 24 hours, and titrated. The doses and method of vaccination are similar to those used in glycerinated suspensions, *viz.*, three injections of 0.01 gm. of the dried material, at successive stages of attenuation, at intervals of twenty days.

With this method the doses of virus are exactly known and immunity is produced with minimal quantities of virus. This method has been used with success for the vaccination of three human subjects.

E. H.

ARAGAO (Henrique de Beaurepaire). Transmission de la fièvre jaune par les tiques. [Transmission of Yellow Fever by Ticks.]—C. R. Soc. Biol. 1933. Vol. 114. No. 29. pp. 137-139.

A record of the successful transmission of yellow fever from infected to normal monkeys by the bites of three species of ticks, *Amblyomma cajennense*, *Ornithodoros rostratus* and *O. moubata*, and also the infectivity of eggs laid by the first of these species.

It was found that when females of the tick *A. cajennense* were inoculated, by means of a fine needle, with a few drops of infected blood, virus was still present six days later. A batch of *A. cajennense* were then allowed to feed on a monkey infected with yellow fever. Three days after being removed from this animal 2 nymphs and 6 females, all partially engorged, were allowed to feed on a normal *rhesus* monkey. After an incubation of 13 days it showed a rise in temperature and died 3 days later with typical symptoms of yellow fever. In addition two monkeys inoculated with emulsions of two female ticks, removed from the first monkey respectively 7 and 14 days previously, both died of the disease. One of these females that had fed on the first monkey began to lay eggs on the 8th day after feeding and continued to lay until killed on the 14th day to prove its infectivity. Eleven days later 200 of these eggs were inoculated into a young monkey which died of yellow fever after 16 days.

An infected monkey was bitten by a batch of *Ornithodoros rostratus*. After an interval of 4 days, 6 of these ticks were fed on a normal monkey, which became infected after an incubation period of 11 days and was killed on the 13th day with typical symptoms of the disease. Additional experiments with *O. rostratus* and *O. moubata* showed that the infection did not persist in these ticks for more than 4 days.

[The presence of yellow fever virus in the eggs of a tick, at least 11 days after being laid by a female that had fed on an infected animal 25 days previously, is a very remarkable observation, and suggests the possibility of *Amblyomma cajennense* being a reservoir of infection.]

E. H.

DAVIS (Nelson C.). The Survival of Yellow Fever Virus in Ticks.—*Amer. Jl. Trop. Med.* 1933. Nov. Vol. 13. No. 6. pp. 547-554.

A description of experiments showing that yellow fever virus will survive in various species of ticks for considerable periods, but no evidence was obtained in support of the view that the virus may pass

from one generation to another through the egg or that the virus was transmitted by the bites of infected ticks at any stage. [Compare with ARAGÃO's results, above.]

Four species of ticks were used in these experiments, *Argas persicus* (Oken), *Amblyomma cajennense* (Fabr.), *Rhipicephalus sanguineus* Latreille, and *Boophilus microplus* Canestrini (= *B. annulatus microplus*). In every case the ticks were allowed to feed on an infected monkey and then tested for infectivity after various intervals. The results show that adult *Argas persicus* injected six days after the infective meal caused fatal yellow fever, adult *A. cajennense* after 15 days caused fatal yellow fever, but after 28 days gave rise to immunity without any clinical signs of the disease, adult *R. sanguineus* after 23 days and nymphs after 10 days both caused fatal yellow fever; and larvae of *B. microplus* injected after 10 days also produced fatal yellow fever. Great irregularity was noticed in the length of time the virus survived in ticks and the above figures represent the maximum periods obtained. There was no evidence that the virus survived from one generation to the next, or from larval to nymphal stages. With reference to ARAGÃO's record of transmission by the bite of *A. cajennense*, it is pointed out that some of the ticks that fed on the monkey were lost, and as the animal had its hind legs free it may have destroyed these ticks. Since yellow fever virus is known to pass through intact skin or mucous membranes, the infection produced in this monkey may have been due to surface contamination with the infected contents of these ticks, rather than the result of their bites. In addition, the virus was found to survive for at least six days in chicken mites that had fed on an infected monkey at the height of fever.

E. H.

DAVIS (Nelson C.), FROBISHER (Martin), Jr. & LLOYD (Wray). **The Titration of Yellow Fever Virus in *Stegomyia* Mosquitoes.**—*Jl. Experim. Med.* 1933. Aug. 1. Vol. 58. No. 2. pp. 211-226. With 1 chart.

The present series of titration experiments shows conclusively that in *Aedes aegypti* the quantity of virus present never surpasses that originally ingested.

A series of tables is reproduced from which it appears that the average mosquito engorging on highly infectious yellow fever blood, contains between 1 and 2 million lethal doses of virus. During the succeeding fortnight there is a reduction of titrable virus to not more than 1 per cent. of that present in freshly fed insects. Subsequently the titre seems to rise but this may be only the result of an increase of extra-cellular virus, and of that more easily freed by grinding. It would appear, therefore, that in spite of the so-called incubation period in the mosquito, during which the virus migrates to the salivary glands, transmission is essentially mechanical, and for this peculiar type the authors suggest the term "delayed mechanical."

E. H.

LLOYD (Wray), PENNA (H. A.) & MAHAFFY (Alexander F.). **Yellow Fever Virus Encephalitis in Rodents.**—*Amer. Jl. Hyg.* 1933. Sept. Vol. 18. No. 2. pp. 323-344. [12 refs.]

After 250 passages in mice there seems to be a progressively increasing degree of fixation for nervous tissue, indicated by a gradually diminishing incubation period. Whereas in the earlier passages most of the

mice died 7 to 8 days after inoculation, at the 250th passage a considerable proportion die within 72 hours and only very exceptionally do they survive over 4 days. It was found that mice inoculated into the fore part of the cerebrum had a shorter incubation period than others inoculated into the cerebellum.

Guineapigs were found to be susceptible to the intracerebral inoculation of the neurotropic mouse virus, and also the agouti (*Dasyprocta aguti*). The nature of the virus was not altered in any way by passage in the nervous system of these two animals. E. H.

THEILER (Max). The Susceptibility of Guinea Pigs to the Virus of Yellow Fever.—*Amer. Jl. Trop. Med.* 1933. July. Vol. 13. No. 4. pp. 399-414. [12 refs.]

Guineapigs were found to be susceptible to the intracerebral injection of yellow fever virus fixed for mice and this virus has been maintained in them for 40 passages by brain to brain inoculation.

The French strain after 158 mouse passages was used to infect guineapigs which from the first developed a typical encephalitis that could be transmitted serially. The course of the disease in these animals was somewhat irregular. The incubation period varied from 4 to 15 days and the animals then showed a temperature of 40°C., or over, for one or two days, and then died, usually without showing any paralytic symptoms. The amount of virus in the brain never exceeded 1:10,000 and was usually 1:1,000, whereas in mice dilutions of 1:1,000,000 were usually infective. There was no obvious change in the virus after passage in guineapigs, either in these animals or in mice. The distribution of the virus in guineapigs and its method of travelling along the nerve tissue is essentially the same as in mice, the blood playing no part in the spread of the virus.

Although guineapigs inoculated intracerebrally with virus from monkeys often died with marked encephalitis, and haemorrhages in the stomach, all attempts to maintain the virus by brain-to-brain passage invariably failed. The intraperitoneal inoculation of the monkey virus into guineapigs was followed by the development of antibodies similar in titre to those obtained from convalescent sera from recently infected men, but no evidence could be obtained that they underwent infection with yellow fever. Haemorrhage into the stomach, which often follows the injection of monkey virus, was found to occur also in guineapigs that had received injections of normal monkey serum, and even in untreated animals, so cannot be considered as of any significance.

The encephalitis produced by the virus fixed for mice was characterized by a perivascular infiltration of mononuclear cells and was sometimes restricted to a small proportion of the vessels. The extensive necrosis of the hippocampus and specific nuclear changes, which are characteristic features in mice, have not been found in guineapigs. Intranuclear acidophilic bodies confined to neuroglial cells, and somewhat resembling those induced in guineapig brains by salivary gland virus, were found in a few cases. Similar inclusions have also been seen on rare occasions in mouse brains. Their nature and significance is unknown. E. H.

FROBISHER (Martin), Jr. **A Comparison of Certain Properties of the Neurotropic Virus of Yellow Fever with those of the Corresponding Viscerotropic Virus.**—*Amer. Jl Hyg* 1933. Sept. Vol. 18. No. 2. pp. 354–374 With 1 fig. [21 refs.]

An interesting comparison of the properties of these two types of yellow fever virus. Both were found to have approximately the same resistance to heat. As regards chemicals the neurotropic virus may have been slightly more resistant to 16·7 per cent ethyl alcohol than the viscerotropic virus, and it also resisted the action of 0·3 per cent. methylene blue

The antigenic properties of the two types, as tested by complement fixation, indicate that antigens prepared from neurotropic material react more strongly with sera from animals immune to this type of virus than with sera from those immune to viscerotropic virus and *vice versa*. The most marked difference was found in the electrical properties. The neurotropic virus in the electrical field had two broad isoelectric zones, one below pH 6·9, and the other above pH 7·2. Between pH 6·9 and 7·2 (the isoelectric range of the viscerotropic virus) it usually migrated to both poles. In the presence of partly laked cells and haemoglobin it migrated, as did the viscerotropic virus under the same circumstances, to both positive and negative poles, even at a reaction well within its isoelectric range. The neurotropic virus in serum suspensions resisted 3 hours exposure to acidities and alkalinities ranging from pH 5·7 to pH 9·2. E H.

HUGHES (T. P.). **A Precipitin Reaction in Yellow Fever.**—*Jl. Immunology*. 1933. Sept. Vol. 25. No. 3. pp. 275–294. With 3 figs. [24 refs.]

The author has elaborated a precipitation test for yellow fever which may be of value in the differential diagnosis of acute infections.

A standard immune serum is run into the precipitation tubes and the serum to be tested carefully layered on top without mixing. The tubes are then heated to 37°C. for two hours and examined by artificial light against a dark background. The development of a ring at the junction of the two sera indicates the presence of a precipitinogen in the serum to be tested and is highly specific. It was found in high concentration in the serum of 53 out of 54 monkeys infected with various strains of yellow fever. The one exception was a monkey that died on the third day following injection but the case was complicated by ulcerative colitis. Sera from 12 monkeys immunized by the injection of virus and immune serum showed no trace of any circulating precipitinogens, and their blood examined 4 weeks later showed no precipitins. There is no parallelism between the virus content and precipitinogen in the serum, for whereas the concentration of the former reaches a high point on the first day of fever and decreases during the terminal day, the precipitinogen does not appear until after the first day and increases up to the end of the infection. Moreover monkeys insensible to the action of yellow fever virus when inoculated with large doses of the virus developed no trace of precipitinogens or precipitins, although protective antibodies were present in high concentration. Monkeys inoculated with the neurotropic virus also failed to show any trace of circulating precipitinogen, but such animals generate precipitins active against an antigen occurring in infected brain tissue.

It was shown that the precipitinogen is associated with the albumin fraction of the serum. The relation of precipitation to complement fixation is discussed and observations are brought forward suggesting that in some cases the precipitation reaction may be the basis for the phenomenon of complement fixation. Both tests were applied to immune sera from 10 persons who had had yellow fever $4\frac{1}{2}$ to $7\frac{1}{2}$ months previously. The precipitin content varied, being entirely absent in 5 of them, and present in the others, one being positive when diluted 1 in 64. The only three giving complement fixation showed precipitin titres of 1 : 16, 1 : 32 and 1 : 64 respectively. The reaction is entirely independent of the protective antibody resulting from an infection.

E. H.

HAAGEN (E). Ueber die Notwendigkeit lebender Zellen zur Virus-züchtung. Weitere Untersuchungen ueber das Gelbfieber-, Variola-Vakzine- und Herpesvirus. [The Necessity of Living Cells in Virus Cultures. Further Studies on Yellow Fever, Variola, Vaccinia, and Herpes Virus.]—*Zent. f. Bakt.* I. Abt. Orig. 1933. Aug. 15. Vol. 129. No. 3/4. pp. 237–254. [25 refs.]

The author made numerous attempts to culture these viruses in the absence of living cells, following the methods described by EAGLES and KORDI. With yellow fever virus although 5 out of 13 such cultures were positive in the 1st passage, there was a marked diminution in the virus content, and further passages were negative. On the contrary, in monkey serum containing living cells from a fowl embryo, the virus multiplied and could be maintained indefinitely in culture passages without any diminution in virus content.

Yellow fever immune serum was found to have no effect on the virus *in vitro*, so long as living cells were present, but when the cells were killed the virus was neutralized by the immune serum. The author's experiments support the view that in the case of these four viruses the presence of living cells is essential for growth in cultures.

E. H.

JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE. 1933. July. Vol. 19. No. 3. pp. 186–200.—Outbreak of Yellow Fever, 1859. Extract from the Journal of Surgeon William MacLeod, R.N., H.M.S. *Madagascar*, at Rio de Janeiro.

An interesting account of an outbreak of yellow fever in 1859, entered under the heading of "Remittent Fever," on board a naval ship at Rio de Janeiro.

E. H.

LAIGRET (J.). La vaccination contre la fièvre jaune. [Vaccination against Yellow Fever.]—*Ann. de Méd. et de Pharm. Colon.* 1933. July–Aug.–Sept. Vol. 31. No. 3. pp. 325–335.

A good general account of the subject with special reference to the titration and preservation of the mouse brain virus used for human vaccinations.

E. H.

MRUGOWSKY (Joachim). Versuch einer Entwicklungsgeschichte des Gelbfiebers. [Studies on the Historical Development of Yellow Fever.]—*Arch. f. Hyg. u. Bakt.* 1933. Nov. Vol. 111. No. 2. pp. 104–112. With 1 fig. [23 refs.]

A general account in which Wegener's hypothesis of shifting continents is invoked to explain the distribution of yellow fever!

E. H.

STILL (John) The Significance of Yellow Fever.—*Jl Roy Army Med. Corps.* 1933. Oct Vol. 61 No 4 pp 268-280. [24 refs]

A general account with special reference to the possible spread of the disease.
E. H.

HOFFMANN (W. H.). Hay fiebre amarilla en Santa Marta ?—Reprinted from
Rev de Med. y Cirug. de la Habana 1932 Vol. 37 No 8 p 598

RELAPSING FEVER AND OTHER SPIROCHAETOSSES

KEMP (Hardy A.), MOORSUND (W. H.) & WRIGHT (Harry E.). **Relapsing Fever in Texas. I. The Identity of the Spirochete.**—*Amer. J. Trop. Med.* 1933 July. Vol 13. No. 4 pp. 425-435.

The authors have studied three strains of spirochaetes from human cases of relapsing fever in Texas, and by means of cross immunity tests (cytolysis, Pfeiffer phenomenon, etc.) show that the organism is immunologically identical with *Spirochaeta novyi*. From the available evidence, the disease seems to be primarily of animal origin and its occurrence in man of a fortuitous nature
E. Hindle.

BRUMPT (E.). Etude de la fièvre récurrente sporadiques des Etats-Unis, transmise dans la nature par *Ornithodoros turicata* [Study of the Sporadic Relapsing Fever of the U.S.A., transmitted in Nature by *O. turicata*.]—*C. R. Soc. Biol.* 1933. Vol. 113. No. 28. pp. 1366-1369.

—. Etude du *Spirochaeta turicatae*, n. sp., agent de la fièvre récurrente sporadique des Etats-Unis transmise par *Ornithodoros turicata*. [Study of *Spirochaeta turicatae* n. sp. its Causal Agent.].—*Ibid.* pp. 1369-1372.

The author was able to obtain 300 examples of *Ornithodoros turicata*, from a cave near Austin, Texas, where cases of relapsing fever had occurred. Incidentally one of the patients, Dr. GRAHAM, collected these ticks, as he was supposed to be immune against relapsing fever, but he acquired a second attack of the disease after visiting the cave, although not conscious of having been bitten by ticks on this occasion. Two strains of the spirochaete from previous cases were studied and found to be transmissible by the bites of *O. turicata*. Mice, rats and *Peromyscus* were successfully infected, but results were negative with a guineapig, two spermophiles and two palm rats or squirrels.

The repeated negative results of all attempts to transmit *S. duttoni*, *S. hispanica* and *S. venezuelensis* by *O. turicata*, compared with the invariable success obtained with the American strain, supports the view that it is distinct from the others. The author after discussing the problem names the causative organism *Spirochaeta turicatae*. [The results of KEMP, MOORSUND and WRIGHT's observation (see above) leave no possible doubt of the identity of this strain with *Spirochaeta novyi* Schellack; consequently *S. turicatae* becomes a synonym of it.]
E. H.

KASSIRSKY (J. A.). Diagnose und Klinik des mittelasiatischen Zecken-Rückfallfiebers. [Diagnosis and Clinical Features of Central Asiatic Tick Fever.]—*Arch. f. Schiff- u. Trop.-Hyg.* 1933. Aug. Vol. 37. No. 8. pp 380-387.

A description of the main features of Central Asiatic tick fever based on a study of 78 cases in the Hospital for Tropical Diseases at Tashkent.

The incubation period is 6 to 14 days and the first attack lasts 3 to 4 days with the usual symptoms of relapsing fever, but the aches of the calf muscles are said to be not so severe as in European relapsing fever. Also, when the temperature falls the patient recovers more quickly than in the latter disease. The number of febrile attacks may be as many as

20, but the average is 8 to 10. The prognosis is good, fatal cases being excessively rare. The spirochaetes—*S. sogdiana* var. *usbekistanica*—like many other tick fever organisms, are somewhat refractory to salvarsan treatment, but good results are said to have been obtained by giving 5 to 6 doses of 0.3 gm. neosalvarsan at intervals of 5 to 6 days. The immunity following the infection is apparently weak and of short duration, for in one case reinfection occurred after 11 months. European relapsing fever confers no immunity against infection with the Central Asiatic tick fever. E. H.

MATHIS (C.), DURIEUX (C.) & ADVIER (M.). Transmission naturelle et expérimentale à l'homme du spirochète infectant dans la nature, à Dakar, la tique *Ornithodoros erraticus* vel *maroccanus*. (Note préliminaire) [**Transmission to Man of the Spirochaete occurring in *O. erraticus* vel *maroccanus* at Dakar.**]—*Bull. Soc. Path. Exot* 1933 Oct. 11. Vol. 26. No. 8. pp. 1094-1098

With batches of ticks, *O. erraticus*, collected from three neighbourhoods in Dakar the authors have made feeding experiments on 10 patients, and in 7 cases produced infection with typical relapsing fever.

Three cases of naturally infected cases of relapsing fever in Dakar are also described. The disease is indistinguishable from tick fever of tropical Africa, transmitted by *Ornithodoros moubata*, but in Dakar this tick is absent and its place taken by *O. erraticus*. E. H.

SERGEANT (André), MANCEAUX (A.) & BALLISTE (R.). Premier cas de fièvre récurrente hispano-africaine observé en Algérie. [**The First Case of Spanish-African Relapsing Fever observed in Algeria.**]—*Bull. Soc. Path. Exot.* 1933. July 12. Vol. 26. No. 7. pp. 906-908.

A record of a case of this disease occurring in a village about 30 miles west of Algiers. The nature of the infection was established by its high pathogenicity for guineapigs, the number and short duration of the relapses and the resistance to treatment with arsenicals. Numerous specimens of *Ornithodoros* were found in the village, living in the burrows of sewer rats. E. H.

HORRENBERGER (R.). Deuxième cas de fièvre récurrente hispano-africaine observé en Algérie. [**A Second Case of Spanish African Relapsing Fever observed in Algeria.**]—*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. pp. 993-995.

The record of a case of this variety of relapsing fever in a European living in the neighbourhood of Algiers. The nature of the infection was confirmed by inoculation into guineapigs. E. H.

BLANC (Georges), NOURY (M.), BALTAZARD (M.) & FISCHER. Présence, chez le pou de l'écureuil de Gétulie, d'un virus récurrent, type hispano-africain, pathogène pour l'homme et le cobaye. [**The Presence of Spanish-African Relapsing Fever, Pathogenic to Man and the Guineapig, in Squirrel Lice from Getulie.**]—*C. R. Acad. Sci.* 1933. Aug. 16. Vol. 197. No. 7. pp. 496-497.

A number of Getulie squirrels (*Atlantoxerus getulus*), collected near Agadir, were found to be heavily infected with lice (*Neohaematopinus pectinifer*). The brain of one of these squirrels was inoculated into a

guineapig, and the contents of 50 lice into a second one. The latter became infected with spirochaetes of Spanish-African type, and the infection was maintained by passage in guineapigs, and also used to produce a typical attack of relapsing fever in a human subject. The first guineapig, inoculated with the brain suspension, showed a rise in temperature, but no spirochaetes were ever detected in its blood. E. H.

ANDERSON (Ch.) & WASSILIEFF (A.). Note sur un nouveau spirochète récurrent pathogène pour l'homme, rencontré chez *Ornithodoros erraticus* du sud tunisien. [New Relapsing Fever Spirochaete Pathogenic to Man, occurring in *O. erraticus* from South Tunisia.]—C. R. Soc. Biol. 1933. Vol. 113. No. 28. pp. 1408-1409.

Specimens of *Ornithodoros erraticus* collected from burrows of *Meriones shawi*, a desert rodent, in the region of Ben Gardane, South Tunisia, were found to be infected with a strain of spirochaetes belonging to the *hispanica* group. The porcupine inoculated with this strain had a short infection with visible spirochaetes; the Meriones had a non-apparent infection with no visible spirochaetes; and a human subject showed a typical attack of relapsing fever. E. H.

SERGEANT (André). Un nouvel agent de transmission naturelle de la récurrente hispano-africaine: la tique du chien (*Rhipicephalus sanguineus*). [New Agent for Natural Transmission of Spanish-African Relapsing Fever: the Dog Tick (*R. sanguineus*).]—C. R. Acad. Sci. 1933. Oct. 2. Vol. 197. No. 14. pp. 717-718.

The author examined the locality where the first Algerian case of Spanish-African relapsing fever occurred and found there numerous specimens of *Ornithodoros*, but 20 of these failed to produce infection in two guineapigs. The patient's dog, however, was heavily infested with *Rhipicephalus sanguineus*, and two of these, a male and a female, both produced spirochaetal infections when inoculated into guineapigs. The dog was examined for 28 days and its brain then inoculated into two guineapigs, but no trace of infection was detected. Larvae of the dog tick were then fed on infected guineapigs and after moulting the nymphs were allowed to gorge on four normal guineapigs. After 17 days incubation period one of these animals, a young individual, became infected, with numerous spirochaetes in the blood. It seems, therefore, that Spanish-African relapsing fever can be transmitted by the bite not only of *Ornithodoros* but also of *Rhipicephalus sanguineus*, the dog tick. E. H.

HIROKI (H.). Experimentelle Untersuchung ueber die Persistenz der Recurrensspirochaeten im Gehirn. III. Mitteilung: Ueber die Persistenz der neuen isolierten Recurrensspirochaetenstämme und die Frage zur Hypothese von Prigge und Rothermundt ueber den Persistierungsmechanismus der Recurrensspirochaeten im Gehirn von Mäusen. [Persistence of Freshly Isolated Strains and the Question of Prigge and Rothermundt's Hypothesis as to the Way in which Relapsing Fever Spirochaetes persist in the Brains of Mice.]—Jl. Oriental Med. 1933. Sept. Vol. 19. No. 3. [In Japanese. German summary pp. 23-26.]

Freshly isolated strains of Manchurian relapsing fever were found to be only very slightly pathogenic to mice, whilst the older strains produced a mortality of 90 per cent.

Four of these freshly isolated strains inoculated into mice never produced a residual brain infection, yet both these strains and the older ones produced similar attacks in human beings.

A series of 20 splenectomized and "blocked" mice were inoculated at the same time as 20 normal controls. The infection in the former was more intense than in the latter, but in neither group did any of the mice show any residual brain infections 28 days after the original attack. After an interval of 60 days from the original infection 10 mice were inoculated with the homologous strain, and in every instance were immune.

The author in discussing PRIGGE and ROTHERMUNDT's hypothesis [see this *Bulletin*, Vol. 25, p. 592; Vol. 26, p. 114] makes a statistical analysis of their comparative mortality statistics for the African and Russian strains, and shows that there is no significant difference between them. Moreover, the results of the author's observations on these freshly isolated strains of Manchurian relapsing fever, only feebly pathogenic to mice, are entirely opposed to those recorded by these authors, and do not support their hypothesis that such strains are more likely to produce residual brain infections. E. H.

MARCHOUX (E.) & CHORINE (V.). Culture du spirochète des poules, Virus visible et invisible. [*The Culture of Visible and Invisible Stages of the Fowl Spirochaete.*—*Ann. Inst. Pasteur*. 1933. Oct. Vol. 51. No. 4. pp. 477-502. [14 refs.]

The authors claim to have obtained cultures of an invisible phase of the fowl spirochaete using methods identical with those used for cultures of the ordinary spirochaete.

The most satisfactory culture medium was obtained by slightly modifying Galloway's method. The inclined clot of white of egg is covered with 5 cc. of a mixture of either 20 per cent. rabbit serum or 10 per cent. horse serum in Ringer's solution or physiological saline.

The addition of 3 to 5 drops of 10 per cent. peptone solution (Witte or Chapoteaut) to each tube brings the pH to between 7·4 and 7·7, the most favourable reaction, and after inoculating each tube with one or two drops of infected material, the medium is covered with a layer of vaseline. Without the addition of peptone the medium is too alkaline and growth of the spirochaetes inhibited. By making subcultures every 4 days rapid multiplication was obtained, but subcultures every 10 days are always successful. The addition of 0·1 per cent. glycogen was found to favour the growth of the organisms, but glucose, hydrolyzed starch, and dextrine had a deleterious effect.

The final medium recommended has the following composition :—

- | | | | | | | | |
|---|-----|-----|-----|-----|-----|-----|-------|
| (1) Horse serum heated to 57-58°C. for three half-hour periods | ... | ... | ... | ... | ... | ... | 10 cc |
| (or rabbit or ox serum treated in the same way | ... | ... | ... | ... | ... | ... | 20 „) |
| (2) 0·9 per cent. sterile physiological saline | ... | ... | ... | ... | ... | ... | 100 „ |
| (3) 10 per cent sterile solution of peptone (Witte or Chapoteaut) | ... | ... | ... | ... | ... | ... | 2 „ |
| (4) 2 per cent. solution of glycogen, sterilized by filtration | .. | ... | ... | ... | ... | ... | 5 „ |

This mixture is run into tubes containing an inclined clot of white of egg in sufficient quantity to immerse the clot and then covered with a layer of vaseline 1-2 cm. thick. The medium will keep for one or two months. Immediately before use it is necessary to add two or three drops of serum, haemoglobin, or preferably fresh defibrinated blood of

any animal. Virulent cultures of spirochaetes were obtained from the contents of infected ticks. The exteriors of the ticks were sterilized by immersing them in 5 per cent. phenol for 15–20 minutes, then washing in ether and drying on either sterile gauze or filter paper. Then by cutting off one of the legs it is possible to collect a small drop of coelomic fluid. By these means sterile cultures were obtained from ticks 9 times out of 13.

Cultures grew best at 37°C but at lower temperatures the spirochaetes remained virulent. The necessary anaerobic conditions could be obtained by omitting the layer of vaseline and even the coagulated egg white and growing the spirochaetes together with *Bacillus eucarians*, a sporulating organism allied to *B. megatherium*. Mixed cultures of this nature have been continued for 62 passages and still remain virulent.

The blood of fowls exposed to the bites of numerous infected ticks was often found to be infective although no spirochaetes could be detected. Moreover, some fowls died without showing spirochaetes, and their blood was infective. Cultures of the blood of such birds were apparently negative for a varying number of passages, made every other day, but eventually showed spirochaetes, from which it is concluded that the invisible phase had grown in the culture tubes. In any particular experiment the tubes all became positive at the same time, but the "negative" period varied between 4 and 20 days in different tests. This invisible phase, like the spirochaete, was unable to pass through Chamberland L2 filters whilst in the blood, but in cultures was readily filterable although the spirochaetes were retained. The invisible phase is said to be present in the cells of the liver and spleen of an infected fowl and also in the blood of infected ticks. Both the invisible phase and the spiral form were found to be virulent.

The authors conclude that there are three stages in the development of the fowl spirochaete: When ingested by the tick, the spirochaete becomes transformed into an invisible but non-filterable stage; this same stage is also found during the first 4 days in the blood of fowls infected by the bites of ticks. In cultures this stage becomes filterable until the reappearance of spiral forms when even the invisible stage again becomes non-filterable. In spite of repeated examinations, no transition forms between the invisible stage and the fully formed spirochaete were ever detected.

E. H.

HIMMELWEIT (Fred). Experimentelle Untersuchungen zum Krankheitsbild und zur Immunität bei der Hühnerspirochätose. [Experimental Studies on the Course of the Disease and Immunity in Fowl Spirochaetosis.]—*Ztschr. f. Hyg. u. Infektionskr.* 1933. Nov. 4. Vol. 115. No. 4. pp. 710–751. With 33 figs. [3 pages of refs.]

The author has repeated the work of a number of earlier investigators and also applied new methods (micromanipulation and tissue culture) and gives a very detailed account of the subject with special reference to the relative importance of phagocytosis and lysis in the disappearance of spirochaetes from the blood at the crisis of the infection, but without arriving at any very definite conclusions.

In common with previous observers the number of spirochaetes injected was found to influence the course of the disease and if very

few were injected the birds might develop an active immunity without showing spirochaetes in the blood. The author has made a careful study of the changes in the blood elements of infected fowls and young chickens. In adult birds at the beginning of the infection there is an absolute as well as a relative neutrophilia with a slight shift to the left. This appearance is accentuated until the height of the infection and is accompanied by an intense monocytosis. After the crisis there is a strong lymphocytosis and the monocytosis falls somewhat. In young chicks there is usually a neutrophilia at the beginning of the infection which changes into a neutropenia after about two days. Unlike adult birds, there is a strong lymphocytosis about the second or third day which continues until death. The monocyte reaction changes repeatedly in the course of the disease. Both adult and young birds showed anaemia, which was very severe in chicks but in adults disappeared a few days after the crisis. In both, the number of thrombocytes fell during the course of the disease, but in adult birds there was a sharp increase after the beginning of the crisis, whilst in young birds there was no corresponding rise. By means of micromanipulation, details of which are described, single blood cells were isolated and grown in a tissue culture medium. These cultures were subsequently infected with fowl spirochaetes and examined under the dark ground. Fibroblasts and small round cells were found to have no effect on living spirochaetes, these still being present in the cultures after 8 to 10 days.

Macrophages isolated from a normal spleen were found to act on the spirochaetes within about 30 hours. Macrophages from the spleen of an immunized bird, however, began to act within one hour and after 12 hours all living spirochaetes had disappeared. The fibroblasts and small round cells showed no phagocytic properties. After the addition of immune serum to cultures of normal macrophages, spirochaetes were ingested, from which it is concluded that spirochaetotropic antibodies are present in immune serum.

E. H.

SCHWETZ (J.). Sur quelques spirochétoses de plusieurs espèces de mammifères, trouvées à Stanleyville (Congo Belge). [**Spirochaetal Infections in Several Species of Mammals found at Stanleyville (Belgian Congo).**].—*Bull. Soc. Path. Exot.* 1933. Oct. 11 Vol. 26 No. 8. pp. 1032–1036.

A record of various spirochaetal infections found in the blood of mammals in the Belgian Congo, and transmission experiments with a strain found in cattle, *S. theileri*.

This spirochaete is very rare at Stanleyville for it was only once found in a herd of 1,000 cattle. Out of 19 cattle from Lake Albert 2 were slightly infected and in a herd of 300 near Stanleyville a 3 months' old calf showed fairly numerous spirochaetes in its blood combined with infections of *Theileria mutans* and *P. bigeminum*. A goat inoculated with its blood, after an incubation period of 20 days showed spirochaetes in the circulation for two days. A guineapig also inoculated remained negative. A single spirochaete 7–8 μ long with 3 spirals was found in a film from a *Cercopithecus* infected with *Plasmodium* and a filaria, but with this exception the examination of large numbers of monkeys belonging to various species has given negative results. One fruit bat, *Eidolon helvum*, out of 73 examined, contained numerous spirochaetes in its blood, with lengths varying from 6 to 20 μ . E. H.

MANTEUFEL (P.) & DRESSLER (I.). Gewebekultur in Tyrodelösung als Kulturmedium für Rekurrensspirochäten. [*Tissue Culture in Tyrode Solution as a Culture Medium for Relapsing Fever Spirochaetes.*—*Zent. f. Bakt.* I. Abt. Orig. 1933. Dec. 4. Vol. 130. No. 3/4. pp. 188-189.

The description of a new method of culturing relapsing fever spirochaetes using tissue cultures in Tyrode's solution.

The authors first redescribe the method of YUAN-PO [see this *Bulletin*, Vol 30, p. 366] which they have found to give very good results in the cultivation of spirochaetes. They then describe a new method which consists in using pieces of allantoic membrane in Tyrode's solution. The membrane is obtained from the eggs after 11 to 12 days' incubation; about 0.15 cc. of the allantoic tissue is put in a container with a mixture of 5 cc. Tyrode's solution and 1 cc. rabbit serum. The medium is inoculated with 1 to 2 drops of citrated blood of the infected animal and the cultures grown at 30-35°C. It is also advisable to add citrated blood to the subcultures. Using this method the authors have maintained a strain of the Spanish-Moroccan spirochaete for 38 passages, without any diminution in virulence for guinea-pigs and mice. The growth of spirochaetes in the cultures is said to resemble that obtained with YUAN-PO's medium.

E. H.

DE BUEN (Sadi). La espiroquetosis española.—*Rev. San. e Hig. Pública* 1932. Nov. Vol. 7. No. 11. pp. 1033-1052. With a full bibliography.

MEDULLA (Candido). La febbre ricorrente del Nord Africa in Cirenaica.—*Arch. Ital. Sci. Med. Colon.* 1933. Aug 1 Vol. 14. No. 8. pp. 484-513. With 19 charts & 3 figs. [21 refs.] English summary (5 lines).

SARDJITO. Enkele eigenschappen van *Spirillum cardiopyrogenes* in de cultuur.—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. June 20. Vol. 73. No. 13. pp. 822-824. With 2 figs. on 1 plate.

VICENTE PANIAGUA (J. M.) & SANCHEZ (Ernesto). Breve historia de la fiebre recurrente española en la provincia de Salamanca y dos nuevos casos diagnosticados en el dispensario de Ciudad Rodrigo.—*Rev. San. e Hig. Pública.* 1933. Sept. Vol. 8. No. 9. pp. 239-244. With 1 fig.

LEPTOSPIROSIS.

KADANER (M.) & CORTI (E.). Etude d'une épidémie ayant sévi parmi les Européens de Stanleyville et due vraisemblablement à *L. ictero-hemorrhagiae*. [*Study of an Epidemic among Europeans at Stanleyville, probably due to S. icterohaemorrhagiae.*—*Ann. Soc. Belge de Méd. Trop.* 1933. Oct. 30. Vol. 13. No. 3. pp. 285-315. With 10 charts. [22 refs.] [Summary appears also in *Bulletin of Hygiene.*]

A description of the clinical symptoms of 16 cases of a febrile infection occurring among Europeans at Stanleyville, Belgian Congo, which was probably a form of Weil's disease, acquired whilst bathing.

This disease has not been recorded previously from the Congo, and in the present series of cases spirochaetes were not found, but three of the sera tested by PETTIT in Paris, and two of the same three tested by

SCHÜFFNER in Amsterdam, were found to agglutinate *S. ictero-haemorrhagiae* in high dilutions. The infection was supposed to be derived from a swimming bath, since all the cases occurred among people who used the bath. Moreover the bath was opened in April and 8 cases occurred between the 3rd and 16th of May. It was then closed and not re-opened till July and 7 new cases occurred between August 18 and September 5, when it was finally closed. The only other case was that of a man who bathed in an adjoining river. Six of the cases relapsed and one was fatal.

E. Hindle.

LINGEN (F. F. L.). Enkele gevallen van leptospirosis in Oeloe-Soengai (Z. en O. Afdeeling van Borneo). [**Cases of Leptospirosis in Borneo.**—*Geneesk. Tijdschr. v. Nederl.-Indië* 1933 Aug. 15. Vol. 73. No. 17. pp 1073-1078.

The description is given of six cases of Weil's disease (leptospirosis), both clinical and bacteriological. The syndrome of the disease as compiled from 5 cases was as follows.—

Acute onset with cold shivering and then an irregular temperature of indefinite type, in all cases more or less injected conjunctivae, headache and lumbar pain with, in two cases, cramps in the calf region and sleeplessness in spite of great exhaustion, diarrhoea or constipation, in all cases marked renal irritation and some albuminuria, strongly positive urobilin reaction, a urinary sediment showing some leucocytes, some erythrocytes and numerous hyaline and leucocyte casts, total anuria in all 3 European cases, uraemia in the fatal case, in all cases lowering of the blood pressure and a soft, enlarged, painful liver, jaundice only in the fatal case, no enlargement of the spleen, slight swelling of the lymph nodes, no leucocytosis, a slight shift to the left and in 2 cases a lymphopenia. No leptospirae could be found in the urine because the appliances were not available.

W. F. Harvey.

MOCHTAR (A.). Over het voorkomen van de ziekte van Weil te Semarang en omstreken. [**Weil's Disease in Semarang and Neighbourhood.**—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1933. Sept. 12. Vol. 73. No. 19 pp 1182-1188.

Nine cases of Weil's disease have been diagnosed in Semarang since the first established case in 1932. None of the patients admitted bathing in the highly polluted canal water. Rats were very numerous in the area from which most of the affected persons came and an investigation into the question of rat-carriage furnished 8 out of 20 sewer rats with leptospira. The actuality of the disease was established by serological (agglutination and lysis) tests and by finding leptospira in the urine.

W. F. Harvey.

BEZEMER (F.). De ziekte van Weil op Celebes. [**Weil's Disease in Celebes.**—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1933. Sept. 12. Vol. 73. No. 19. pp. 1194-1203. With 1 map.

An account is given of five cases of Weil's disease in Celebes with two deaths and with the typical quartet of symptoms—fever, jaundice, enlargement of spleen and haemorrhagic nephritis. Leptospiras were isolated, pathogenicity established in the guineapig and serum tests shown to be positive. These are the first cases to be described in Celebes.

W. F. Harvey.

RUYS (A. Charlotte). Het aantoonen van *Leptospira icterohaemorrhagiae* in bloed met behulp van tweevoudige centrifugatie. [Demonstration of *Leptospira icterohaemorrhagiae* in Blood by Double Centrifuging.]-*Nederl. Tijdschr. v. Geneesk.* 1933. Aug. 12. Vol. 77. No. 32. pp. 3654-3658. English summary (5 lines)

Weil's disease may be difficult to diagnose clinically even with spirochaetes present in the blood. The diagnosis, however, is at once established by the demonstration of the spirochaete itself. Experiments are here given which were devised to find the best anticoagulant for the blood, the best speed at which to centrifuge, and the buffer reaction which gave the best results.

The final method arrived at was :—

(1) Centrifuge for 15 mins at 1,500 revolutions $4\frac{1}{2}$ cc. test blood in $\frac{1}{2}$ cc. 1 per cent sod oxalate made up with the buffer solution—sod. hydrogen phosphate 9.45, pot. dihydrogen phosphate 0.55 (2) Examine a drop of the clear supernatant plasma by dark field with an objective C ($\times 20$) without coverglass or with an objective D ($\times 40$) with a coverglass for living spirochaetes (3) Mix equal quantities of the plasma and a buffer solution of pH 5.3 (Disod. hydrogen phosphate 0.25, pot dihydrogen phosphate 9.45). (4) Centrifuge 30 mins at 3,000 revolutions (5) Examine the sediment under a coverglass with objective D for spirochaetes

W. F. Harvey.

BASILEWSKY (B. G.). Ueber die Bedeutung des Wassers und der Ratten in der Epidemiologie der ikterohaemorrhagischen Spirochaetose [Relative Significance of Water and Rats in the Epidemiology of Spirochaetal Jaundice.]-*Zent. f. Bakt.* 1. Abt. Orig. 1933. Oct. 6. Vol. 129. No. 7/8. pp 502-505.

The author attempted to infect guineapigs with various strains of leptospira isolated from the water in the province of Kiev. All experiments gave negative results, although, in addition to normal animals, one series comprised 23 splenectomized guineapigs, in which blockage of the reticulo-endothelial system had also been made.

On the contrary, 30.7 per cent. of 91 wild rats were found to be infected with a leptospira pathogenic to guineapigs. Therefore the author considers that the rat is the important epidemiological factor in human cases of Weil's disease.

E. H.

UHLENHUTH (P.) & ZIMMERMANN (E.). Die weisse (zahme) Ratte als Ueberträgerin des Erregers der Weilschen Krankheit (*Spirochaeta icterogenes*). [The White Rat as a Carrier of the Infective Agent of Weil's Disease (*S. icterogenes*).]-*Deut. Med. Woch.* 1933. Sept. 8. Vol. 59. No. 36. pp. 1393-1395.

White rats are found to be susceptible to infection with *S. icterohaemorrhagiae* in the same way as wild rats.

Infection in white rats as a rule seems to be the result of contact with infected wild animals and in one experiment where three infected wild rats were placed in the same cage as six tame rats, one of the latter became infected, whilst five remained negative. Seven serologically positive wild rats were kept with six negative ones, and after 10 weeks two of the latter had become infected whilst four remained negative. It is possible for man to acquire the infection

from white rats and a case is described in which a laboratory attendant was bitten by an infected white rat and subsequently developed an attack of Weil's disease.

E. H.

PETZETAKIS (M.). Ueber die Empfänglichkeit der Feldmaus für die Icterogenes-Spirochäten. [The Susceptibility of the Field Mouse to Spirochaetal Jaundice.]—*Zent. f. Bakt.* I. Abt. Orig. 1933. July 11. Vol. 129 No. 1/2. pp. 41-42. With 3 text figs.

Contrary to general opinion, the author finds that the field mouse is very susceptible to infection with *Spirochaeta icterohaemorrhagiae*.

Two individuals inoculated with 2 cc. of a suspension of blood and organs from an infected guinea pig died of the infection within 2 days. When the dose was halved, two inoculated animals died after 4 and 5 days respectively, and when the dose was yet further reduced, after 5 and 6 days. The latter all showed a rise in temperature followed by terminal hypothermy. Jaundice was present at death and petechial haemorrhages in the lungs. Spirochaetes were observed in the liver and kidneys.

E. H.

THIRY (U.). Chimiothérapie des leptospiroses spontanée et provoquée chez la souris blanche [The Chemotherapy of Spontaneous and Induced Leptospirosis in White Mice.]—*C. R. Soc. Biol.* 1933. Vol. 114. No. 29. pp. 172-174.

Sixty white mice, some spontaneously infected with the Ghent mouse strain and the others with a chronic strain of *Spirochaeta icterohaemorrhagiae*, have been treated by means of various therapeutic substances. Favourable results were obtained with bismuth and with gold and sodium thiosulphate.

The animals were found to withstand relatively high doses of bismuth, and also of arsenic, antimony and gold, but oily suspensions were only absorbed with difficulty. Salts of arsenic and antimony were found to have little or no influence on the infection. Bismuth salts were efficacious in moderate doses, for a single injection of an aqueous suspension of 0.5 cgm. bismuth oxychloride caused the spirochaetes to disappear from the urine within 3 days. Mice readily withstand a dose of 4.0 cgm. of this compound. Favourable results were also obtained with an aqueous solution of the thiosulphate of gold and sodium. The *dosis tolerata* of this compound is at least 0.8 cgm., and a quarter of this was sufficient to cure the mice within two or three days. No differences were observed between the two kinds of infections either *in vitro* or in their response to treatment in the mouse. The favourable results obtained not only with bismuth, but also with gold and sodium thiosulphate, suggest the use of the latter compound in the treatment of human infections.

E. H.

CLEYNDELT (P. C.), Jr. Spirochaetosis Icterohaemorrhagica—*Nederl. Tijdschr. v. Geneesk.* 1933. June 10. Vol. 77. No. 23. pp. 2641-2647. English summary (4 lines).

DINGER (J. E.). Een geval van de ziekte van Weil te Batavia met enkele opmerkingen naar aanleiding van den daarbij geïsoleerden leptospirenstam—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. Mar. 28. Vol. 73. No. 7 pp. 402-407.

- KLARENBECK (A) & SCHÜFFNER (W A P). Het voorkomen van een afwijkend leptospira-ras in Nederland.—*Nederl. Tijdschr. v. Geneesk.* 1933. Sept. 16 Vol. 77. No 37 pp. 4271-4276 English summary (5 lines).
- KRAMER (P H). De ziekte van Weil zonder icterus.—*Nederl. Tijdschr. v. Geneesk.* 1933 June 10. Vol. 77. No 23. pp. 2652-2667. With 6 figs. (2 on 1 plate). French summary (7 lines)
- MEDULLA (Candido). Sopra un caso di malaria terzana semplice recidiva complicata a febbre ittero-emoglobinurica.—*Arch. Ital. Sci. Med. Colon.* 1933. July 1 Vol. 14 No. 7. pp. 433-441. With 1 chart. [20 refs.] English summary (4 lines).
- RAGIOT & DELBOVE. Spirochétose ictéro-hémorragique bénigne.—*Bull. Soc. Méd.-Chirur. Indochine* 1933. Jan.-Feb Vol 11 No. 1 pp. 16-19

RAT-BITE FEVER.

- SCHÖBL (Otto), HIRANO (H.), VAZQUEZ-COLET (Ana), RAMIREZ (José) & ARIMA (S.). Study concerning Rat-Bite Fever in Manila, Philippine Islands.—*Philippine J. Sci.* 1933. May. Vol. 51. No. 1. pp. 1-67. With 10 plates & 18 figs.

A detailed account of rat-bite fever in Manila, including a comparative analysis of the distribution of rat-bite fever and that of plague.

During the year 1931-1932, eleven strains of *Spirillum minus* were isolated from patients suffering from the disease and resident in Manila. Spirilla from the blood of infected guineapigs were found to survive 8 hours *in vitro*, but were never viable 24 hours or more after the blood had been removed from the infected animals.

The clinical manifestations of the disease in Philippine monkeys varied mainly according to the method of inoculation, but typical cases showed an initial local manifestation, then regional dissemination, followed by general manifestations, fever and exitus. After intradermal inoculation the primary local lesion develops in a few days. This lesion persists for some time, starting as an elevated induration which soon becomes surrounded by an oedematous area of a characteristic purplish-blue tinge. Eventually the primary lesion heals without scars. The subsequent dissemination of the infection followed the lymphatic system and among general manifestations noted were fever, general lymphadenitis and diarrhoea.

In guineapigs and rabbits the general lesions were more varied than in the monkey and for experimental studies there is no advantage in using monkeys. The presence of spirilla in the circulating blood of infected monkeys was intermittent and they are so rare that in no case were they detected by dark ground examination, but only by inoculation into guineapigs and white mice. After about 2 months the blood became negative. In guineapigs the spirilla could be seen microscopically in the blood after 8 to 39 days' incubation period. They could be found, however, at the site of the local lesion on the first day of its development and the periphery showed more spirilla than the centre.

Infected guineapigs were treated with various drugs, and satisfactory results obtained with neosalvarsan and stibosan. A human patient was treated with stovarsol and another with stibosan; both drugs

were found to be effective, but the second patient after being apparently cured, developed a relapse and was finally given stovarsol.

A characteristic leucocyte reaction accompanies an attack of the disease. The reaction consists of leucocytosis, due mainly to an increase of polymorphonuclears, but also to the increase of "staf-nucleated" leucocytes and concomitant lymphocytopenia. The leucocytic reaction coincides with the rises in temperature.

Immunity was studied by means of superinfection, that is, by the inoculation of infected animals, and also by the reinoculation of treated animals. The immunity is said to be analogous to that in syphilis and yaws. The course of the disease in super-infected animals was more rapid, and in half the animals enormous numbers of spirilla were found in the circulating blood when super-infection was performed within seven weeks of the original inoculation. When treated animals were exposed to reinfection certain clinical signs were altered. The initial lesion was smaller and healed more quickly, and in highly immune animals failed to develop, and fever was either slight or absent. Such animals, however, always contained spirilla in the internal organs, but these could only be detected by subinoculation into normal animals.

Attempts were made to determine whether there was any intra-uterine transmission of infection or immunity. Four litters of young white mice from three infected mothers, two of which contained spirilla in the blood at the time of delivery, showed no signs of infection or immunity. Similarly fetuses of infected guineapigs also showed no spirilla. Attempts to transmit the disease by the direct contact of normal and healthy guineapigs gave negative results, but normal guineapigs bitten by infected ones developed typical lesions and died of the disease.

Finally the authors discuss the relation between the distribution of human plague and rat plague in Manila during 1912-14 and the distribution of human cases of rat-bite fever in 1931-32. A complete agreement was found to exist between the two as regards the districts affected and it is suggested that a plan of attack against rat plague may be based on the recurrence of the two rat-borne diseases in the same localities of the city.

E. Hindle.

LE CHUITON (F.) & MOUREAU (M.). Production de périorchite et d'orchite chez le cobaye par injection intrapéritonéale d'une souche humaine de sodoku japonais. [**Production of Periorchitis and Orchitis in the Guinea-pig by the Intraperitoneal Injection of a Human Strain of Japanese Sodoku.**—*C. R. Soc. Biol.* 1933. Apr. 27. Vol 112. No. 14. pp. 1380-1381.]

The authors inoculated six guineapigs with a Japanese strain of *Spirillum minus*, which is said to be more virulent than the Bordeaux strain, in order to determine whether the periorchitis was due to these organisms alone, or to a simultaneous injection of rat typhus. The results show that *S. minus* infection in the guineapig may produce not only periorchitis, but also orchitis with congestion and a monocytic inflammation.

The Meinicke reaction was strongly positive in 3 guineapigs, slightly positive in one, and negative in one. The Kahn reaction strongly positive in one, feebly positive in two, and negative in one. E. H.

GUPTA (B. M. Das) & CHATTERJEE (S. N.). **Experimental Studies with a Spirillum found in the Nasal Cavity of Some Lepers.**—*Indian Med. Gaz.* 1933. Aug. Vol. 68 No. 8. pp. 453–455. With 2 charts & 4 figs. on 1 plate.

Spirillum minus was found by the authors in the nasal smears of four cases of leprosy out of over 3,000 examined.

The nature of the spirillum was proved by the inoculation of nasal scrapings into mice and guineapigs, which both showed generalized infections, and two human volunteers inoculated with the blood of infected mice developed typical symptoms of rat-bite fever. In turn mice were infected from the blood of both volunteers. It is suggested that the patients had been bitten by rats during sleep on anaesthetic spots without being aware of it.

E. H.

VENOMOUS SNAKES AND SNAKE VENOMS. I*

In the period under review local ophidian surveys have been made in several countries. Thus, CORKILL¹ reports that in Iraq five out of a total of twenty-four species are dangerous to man, these are the hook-nosed snake, *Enhydrina schistosa*, the hoodless cobra, *Naja morgani*, and three vipers—*Vipera lebetina*, *Cerastes cornutus* and *Echis carinatus*. Five out of fifteen bites by *V. lebetina* were fatal. KOPSTEIN² states that there are eleven poisonous land snakes in Java, three of which belong to the Viperidae and eight to the Proteroglyph Colubrids (sub-family Elaphinae), occasional fatalities are recorded. Of the sixteen sea-snakes little is known regarding their lethality to man. SMART³ in an article on the commoner poisonous snakes in Malaya points out that only six deaths have been reported there during the last four years.

Laboratory Studies on Snake Venoms.

The typical mode of death in mammals poisoned by Colubrid venoms is by asphyxia resulting from failure of respiratory movement, and this result, despite evidence to the contrary, has been widely attributed to a direct action of such venoms upon the respiratory centre.

(1) *The Peripheral versus the Central Action of Venom*—ROGOTI in 1891 expressed the view that the fatal asphyxia in Colubrid bites resulted from a peripheral curari-like paralysis of the muscles of respiration, and this hypothesis was subsequently upheld by ARTHUS, CUSHY and YAGI and HOUSSAY and his colleagues. ESSEX and MARKOWITZ have conclusively demonstrated the peripheral action of certain of the viperine venoms and recent papers emanating from the Hall Research Institute, Melbourne, support the peripheral action of the Australian colubrid venoms which to date have been investigated. Thus, KELLAWAY and HOLDEN⁴ find that all the common Australian snake venoms possess a curarizing action on the frog which is easily demonstrated in isolated nerve-muscle preparations, but less readily in the intact animal. The action resembled that of curari in respect of the changes produced in direct and indirect chronaxie.

*Previous reviews of current literature on this subject, by the late Lt -Colonel A. ALCOCK, appeared in the Medical Zoology Section in this *Bulletin*, 1932, Vol. 29, at pp. 169-73 and 852-4

¹ CORKILL (Norman L.). An Inquiry into Snake-Bite in Iraq.—*Indian Jl. Med. Res.* 1932. Oct & 1933 Jan Vol 20. Nos 2 & 3 pp. 599-625; 679-696 With 5 plates & 1 map. [43 refs]

² KOPSTEIN (Felix). Die Gifttiere Javas und ihre Bedeutung für den Menschen.—*Meded. Dienst d. Volksgezondheid in Nederl -Indië* 1932. Vol. 21. No. 4. pp. 222-256. [Refs. in footnotes.]

³ SMART (A. G. H.). A Short Synopsis of Some of the Commoner Malayan Snakes, with Special Reference to the Venomous Snakes.—*Malayan Med Jl.* 1932. Dec. Vol. 7 No. 4; & 1933. Mar Vol. 8. No 1 pp. 118-124; 49-59. [14 refs]

⁴ KELLAWAY (C. H.) & HOLDEN (H. F.). The Peripheral Action of the Australian Snake Venoms. I. The Curari-like Action on Frogs.—*Australian Jl. Exptl. Biol. & Med. Sci.* 1932 Sept. 16. Vol. 10 Pt. 3 pp. 167-179 [15 refs.]

KELLAWAY, CHERRY and WILLIAMS⁵ next investigated whether this curarizing action was present in mammals, whether or no it constituted the predominant cause of respiratory failure, and whether there was any evidence of direct action of venoms upon the central respiratory mechanism. In rabbits and cats faradic stimulation of the phrenic nerve and of the diaphragm itself shortly after respiratory failure revealed curarization with seven out of eight Australian venoms at a time when the heart was beating strongly and the blood pressure well maintained under artificial respiration. The venom of *Pseudechus australis* constituted the one exception; it caused death by direct action on heart muscle. The question of the relative merits of central and peripheral action in causing fatal respiratory failure was investigated in animals by an ingenious method depending on the application to the phrenic nerve of non-polarizable electrodes, which were connected to capacity amplifiers in such a manner that a clearly audible record of any descending motor impulses in the nerve was obtained by the loud speaker. By this means it was clearly shown in rabbits that the Colubrid venoms kill by their curarizing effects.

In considering the evidence on which the older views of central respiratory failure were based, the authors point out that the initial acceleration in rate and increase in depth of respiration may be otherwise explained than by the primary stimulation preceding secondary failure, that the concentration of dry venom used by ELLIOT when he applied it to the floor of the 4th ventricle was incomparably greater than that which occurs under natural conditions, and that the histological changes in the central nervous system described in Australia by KILVINGTON and by LAMB and HUNTER in India were probably attributable to asphyxia, and not to neurotoxin. The experiments of KELLAWAY and colleagues in which venom in moderate concentration was applied to the floor of the 4th ventricle suggested that though venom in lethal dosage had some action on the central respiratory mechanism, which might be indirect and due to local vaso-constriction, this central action played no important part in respiratory failure following the injections of venoms. KELLAWAY⁶ also investigated the reversibility of the curari-like action for the venoms of the tiger snake (*Notechis scutatus*) and the copper-head (*Demsonia superba*) using monovalent antivenenes prepared by the Commonwealth Serum Laboratories. It was found that while curarization with these venoms was reversible, the reversibility was more difficult to demonstrate than in the case of cobra venom which possesses a more predominantly curari-like action. ISWARIAH⁷ in correspondence disagreed with the views expounded by KELLAWAY⁸ maintaining that with Indian cobra venom death was definitely due to central and not to peripheral respiratory paralysis, as pointed out by ROGERS.

⁵KELLAWAY (C. H.), CHERRY (R. O.) & WILLIAMS (F. Eleanor). The Peripheral Action of the Australian Snake Venoms. 2. The Curari-like Action in Mammals.—*Australian Jl. Experim. Biol. & Med. Sci.* 1932. Sept. 16. Vol. 10. Pt. 3 pp. 181-194. With 1 fig. [30 refs.]

⁶KELLAWAY (C. H.). The Peripheral Action of the Australian Snake Venoms. 3. The Reversibility of the Curari-like Action.—*Australian Jl. Experim. Biol. & Med. Sci.* 1932. Dec. 16 Vol. 10. Pt. 4. pp. 195-202.

⁷ISWARIAH (V.). Snake Venoms. [Correspondence].—*Brit. Med. Jl.* 1933. Aug. 12. p. 315.

⁸KELLAWAY (C. H.). Some Peculiarities of Australian Snake Venoms.—*Trans. Roy Soc. Trop. Med. & Hyg.* 1933 June 29. Vol. 27. No. 1. pp. 9-21. [36 refs.]

(2) *Snake Venom Haemolysis*.—KELLAWAY and WILLIAMS⁹ found the Australian snake venoms fell into two groups: those like black snake and copper-head venom which haemolyse directly without serum activation, and those like death adder and tiger snake venom which have only a negligible action on washed cells. In another communication¹⁰ the peculiarities and the nature of haemolysis were studied. Haemolysis with Australian venoms proved essentially similar to that of other venoms, and depended upon a lecithinase acting at the limiting surface of the corpuscle, it was subject to the same ionic influences at this interface as haemolysis by cobra venom. Complement played an insignificant rôle in the haemolysis, but inhibition by serum was a frequent phenomenon and was not constantly associated with diminution of the swelling of the cells which normally precedes venom haemolysis.

VILLARD and MIGUELOTE-VIANNA¹¹ studied *in vivo* the changes in the blood of dogs following the injection of *Lachesis atrox* venom. Loss of coagulability was attributable to the action of venom proteases on fibrinogen and was found to be entirely independent of anti-thrombins though these were definitely increased. Following intravenous injection there was an initial diminution in the natural haemolytic power of the serum due to destruction of complement, secondly, a phase of enhanced haemolytic action lasting one-quarter to six hours due to the activation of the blood phosphatids by the venom, and finally, a phase in which the blood completely lost its haemolytic properties and became anticomplementary, during this last phase venom disappears from the circulation and the blood again becomes spontaneously coagulable. Various hypotheses to explain these phenomena were discussed.

(3) *Other Pharmacological Studies*.—KYU¹² studied the pharmacological properties of venoms of two of the crotaline snakes of Formosa—*Trimeresurus macrosquamatus* and *Trimeresurus gramineus*—injected into frogs, mice and rabbits; the lethal dose on subcutaneous injection in mice proved to be 0.005 mgm. per 1 gram body weight, and 1.0 and 5.0 mgm. per kilo respectively for the rabbit. IWASE¹³ investigated *Naia naia atra* poisoning in *Rana tigerina*, the mouse and the rabbit. Death resulted by respiratory paralysis, the heart continuing to beat for some little time after complete cessation of respiration. The minimum lethal dose for rabbits was 0.1 to 0.5 mgm. per kilo.

^{9, 10} KELLAWAY (C H) & WILLIAMS (F Eleanor) Haemolysis by Australian Snake Venoms. I. The Comparative Haemolytic Power of Australian Snake Venoms. 2. Some Peculiarities in the Behaviour of the Haemolysis of Australian Snake Venom.—*Australian Jl. Experim Biol & Med Sci.* 1933. June 16 Vol. 11 Pt. 2. pp 75-80 [10 refs.], 81-94 [23 refs.]

¹¹ VELLARD (J) & MIGUELOTE-VIANNA (M.) Modifications sanguines provoquées *in vivo* chez le chien par le venin de *Lachesis atrox*—*Ann. Inst Pasteur* 1932. Oct. Vol. 49. No. 4. pp 445-472 With 14 figs

¹² KYU (Kenton). Toxikologische Untersuchungen ueber die Gifte der Crotalinae Formosa's I. Mitteilung. Studien ueber das Gift von *Trimeresurus mucrosquamatus*, Cantor. II. Mitteilung. Studien ueber das Gift von *Trimeresurus gramineus*, Shaw.—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1933 June. Vol. 32. No 6 (339). [In Japanese. German summaries pp. 79-80; 84-85]

¹³ IWASE (Y.). Ueber die toxikologischen Wirkungen des Naja-naja-atra-Giftes.—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1933. May. Vol. 32. No. 5 (338). [In Japanese German summary pp 57-59.]

BAYER and ELBEL¹⁴ reviewed the work of FAUST who holds that the active principles of certain snake venoms are sapotoxins, but their experiments did not support FAUST's hypothesis. MACHT and DAVIS¹⁵ exposed four venoms to ultra-violet radiations from a mercury vapour quartz lamp, rapid deterioration in potency resulted as measured by their toxicity for mice and *Lupinus albus* seedlings.

(4) *Fractionation of Venoms*.—HOLDEN¹⁶ who had previously investigated the results of fractionation of death adder venom (*Ancanthopis antarcticus*) by extraction with 45 per cent. ethyl alcohol, now reports the production of thrombin-free fractions of the venoms of the tiger (*Notechis scutatus*), the black tiger snake (*Notechis scutatus* var. *niger*) and the black snake (*Pseudechis porphyriacus*). Various grades of pyroxylin membranes were first tested by filtration at low and moderate pressures, but the results were disappointing. Then MARTIN's method of differential ultra-filtration under high pressure through gelatine membranes supported on filter candles was tried, the original apparatus employed by MARTIN in 1896 being actually used in the experiments; a reasonable yield of venoms minus practically all its thrombin was obtained, but large enough amounts could not be produced by this means. Experiments with various adsorbents were next instituted, and freshly precipitated barium carbonate was found much the most effective; by means of it as much as 99.9 per cent. of thrombin was removed from certain venoms.

IWASE¹⁷ describes two main constituents in *Naja naja atra* venom. The main component A, which was precipitated by complete saturation with ammonium sulphate, constituted 9 to 11 per cent. of the venom, and caused motor and respiratory paralysis in mice, while component B, which was precipitated by 38 to 60 per cent. ammonium sulphate, constituted 60 to 80 per cent. of the whole venom and produced local effects on injection into mice. The virulence of both components was much reduced by digestion with trypsin so both were considered to be of an albuminoid nature. The result of immunization experiments with these two components A and B are discussed in another paper¹⁸; rabbits were easily immunized with component A, but not with B, and the serum B-immunized rabbits precipitated and neutralized both B and A components, whereas sera of A-immunized animals neither precipitated nor neutralized the B component. The author concludes that for the preparation of an immune sera against

¹⁴ BAYER (G.) & ELBEL (H.). Zur Frage der Saponinnatur der Schlangengifte.—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1933 Vol. 78. No. 1/2. pp. 82-85

¹⁵ MACHT (David I.) & DAVIS (Mary E). Effect of Ultra-violet Rays and of Methylthionine Chloride and Heparin on Snake Venoms.—*Proc. Soc. Experim. Biol. & Med.* 1933. Apr. Vol. 30. No. 7. pp. 990-993.

¹⁶ HOLDEN (Henry Francis). The Fractionation of Australian Snake Venoms. 2. The Venoms of the Tiger Snake (*Notechis scutatus*), Black Tiger Snake (*Notechis scutatus* var. *niger*), and Black Snake (*Pseudechis porphyriacus*).—*Australian J. Experim. Biol. & Med. Sci.* 1933. Mar. 16. Vol. 11. Pt. 1. pp. 1-7

¹⁷ IWASE (Y). Ueber die Isoherung der toxischen Komponenten im Naja-naja-atra-Gift.—*Taiwan Igakkai Zasshi (J. Med. Assoc. Formosa)*. 1933. Apr. Vol. 32. No. 4 (337). [In Japanese. German summary pp. 50-51.]

¹⁸ IWASE (Y.). Immunologische Untersuchungen ueber die wichtigeren Schlangengifte in Formosa. III. Bericht; Immunogenität der fraktionierten Komponenten des Naja-naja-atra-Giftes und Beziehungen zwischen Antitoxin- und Präzipitinwert.—*Taiwan Igakkai Zasshi (J. Med. Assoc. Formosa)*. 1933. May. Vol. 32. No. 5 (338). [In Japanese. German summary pp. 59-60.]

Nasa naia atra it is advisable to use the less toxic fraction B because the mortality is less and it is possible to obtain more potent anti-serum than with either fraction A or whole venom

(5) *Sterility of Snake Venom*.—KELLAWAY and WILLIAMS¹⁹ investigated three samples of a commercial preparation of modified viperine venom put on the market for the treatment of epilepsy, they isolated three sporulating organisms, *B. subtilis*, *Vibrio septique* and a bacillus resembling *Bacillus cochlearius*. The authors emphasize that special precautions are necessary to insure and maintain the sterility of any snake venom to be inoculated into man for therapeutic purposes

Antivenenes.

Though the claims of the French school regarding the universality of the curative properties of the *sérum antivenimeux* introduced by CALMETTE in 1894 were not subsequently upheld, the specific neutralizing properties of antivenene when employed against the venom used in its production have been universally recognized. BRAZIL and others have also shown that with certain monovalent antivenenes, the serum obtained by inoculating venom from one species of snake may possess some neutralizing effect, though in less degree, on the venoms of other snakes which are, as a rule, closely zoologically related. SCHLOSSBERGER and MENK²⁰ have recently investigated the effects of venom antivenom inoculation in white mice, testing the venoms of numerous species of European venomous snakes against four different antivenenes—the Paris *sérum antivenimeux* E. R., two monovalent anti*jararaca* sera and a polyvalent anti*bothrops* serum (serum Wien). Cross protection was demonstrated to a variable degree. Thus the Paris serum E. R. prepared with *Aspis* and *Pelias* venom showed a well marked neutralizing power with certain venoms of the genera *Pelias*, *Mesovipera* and *Coluber*. With the vipers belonging to the genus *Mesocoronis*, however, serum E. R. possessed little or no neutralizing power, whereas serum Wien was effective, though of little use for the venomous genera *Pelias* and *Mesovipera*.

(1) *Detoxication of Antivenenes*.—The great toxicity of ophidian venoms has made the production of specific high titre antivenenes from horses a prolonged, hazardous and decidedly expensive affair so that any process such as detoxication of venom with simultaneous preservation of its antigenic properties becomes a matter of great practical importance to countries interested in the manufacture of antivenenes on a large scale. During the period under review GRASSET and ZOUTENDYK^{21,22,23} of the South African Institute of Medical Research

¹⁹ KELLAWAY (Charles H.) & WILLIAMS (F. Eleanor). The Investigation of the Toxicity and Sterility of a Commercial Preparation containing Modified Snake Venom—*Med Jl Australia* 1933 May 13. 20th Year Vol. 1. No. 19. pp 581-586 With 6 figs.

²⁰ SCHLOSSBERGER (H.) & MENK (W.) Experimentelle Untersuchungen ueber die Serumbehandlung der Bisse europäischer Giftschlangen—Reprinted from *Festschrift f. Dr Emil Burg, Bern, 1932* p 296. [11 refs]

²¹ GRASSET (E.) & ZOUTENDYK (A.). Méthode rapide de préparation de sérums antivenimeux polyvalents—antivipéridés et cobras—au moyen des anavenins formolés—*C. R. Soc. Biol* 1932. Nov. 4. Vol 111 No. 33 pp 432-434.

²² GRASSET (E.) & ZOUTENDYK (A.). Sur la vitesse d'apparition de l'immunité et des anticorps antivenimeux vipéridés et cobras, chez les animaux vaccinés par les anavenins formolés—*C. R Soc Biol* 1933 Vol. 113 No 28. pp. 1455-1457.

have written several papers dealing with detoxication of snake venoms and rapid methods of antivenomous vaccination and serum production. A number of venoms were subject to detoxication by bile, solganal—an organic gold preparation, and formalin, the relatively atoxic venom derivatives being subsequently used for immunization experiments in animals. Concentrated solutions of viperine venoms dissolved in saline and colubrine venoms dissolved in broth were readily detoxicated at 37°C. by means of formalin, the atoxic derivatives being highly antigenic. Domestic animals and donkeys were actively vaccinated by a course of three or four subcutaneous injections. By the hyperimmunization of horses both monovalent and polyvalent antivenenes of exceptional potency were obtained in a few weeks with ease and safety.

(2) *Concentration of Antivenenes*—In snake bite, the biting snake frequently remains unidentified, and in countries where numerous poisonous species abound resort to a polyvalent antivenene has proved necessary. Polyvalent antivenenes, however, are very bulky for intravenous and intramuscular use, and in consequence some method of increasing their potency by concentration, such has been successfully applied to the manufacture of antivenenes in Brazil, South America and the United States, becomes highly desirable. In 1929 a polyvalent antivenene was produced at the South African Institute of Medical Research, and utilizing a modification of the Brunner-Pinckus process employing sodium sulphate precipitation and subsequent dialysis to obtain the purified pseudo-globulin fraction of the serum, GRASSET^{24, 25} reports the production of a two-fold concentration of antivenom serum against African Viperidae and Colubridae, 1 cc. of which neutralizes either 10 mgm. *Bitis* venom or 1.8 *Naia* venom. MAITRA, NAIDU and AHUJA²⁶ record a still further improvement with the sodium sulphate method whereby the loss of unitage did not exceed 20 per cent., a three-fold concentration of the Kasauli polyvalent venom was obtained so that 1 cc of the concentrated product neutralized 3.0 mgm. of daboia and 1.5 mgm. of cobra venom. Provided the potency of this concentrate is maintained for a year under ordinary conditions of storage, the authors think the method should be suitable for the manufacture in India of a potent purified antivenene on a large scale. For technical details the original papers should be consulted by those interested.

(3) *Treatment with Antivenenes*.—DO AMARAL²⁷ stresses the important fact that snake poisoning is much more severe in children

²³ GRASSET (E.) & ZOUTENDYK (A.). Detoxication of Snake Venoms, and the Application of the Resulting Antigens to Rapid Methods of Antivenomous Vaccination and Serum Production.—*Brit J. Experim. Path.* 1933. Oct. Vol. 14 No. 5. pp 308-317. [11 refs]

²⁴ GRASSET (E.). Concentration of Polyvalent African Antivenom Serum.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1932. Nov. 30. Vol. 26. No. 3. pp. 267-272. [15 refs]

²⁵ GRASSET (E.). Concentrated African Antivenom Serum: its Preparation, Standardization and Use in the Treatment of Snake-Bite.—*South African Med. J.* 1933 Jan. 28 Vol. 7. No. 2. pp. 35-39.

²⁶ MAITRA (G. C.), NAIDU (B. P. B.) & AHUJA (M. L.). Concentration of Antivenomous Serum.—*Indian J. Med. Res.* 1933. July. Vol. 21. No. 1. pp. 229-236

²⁷ DO AMARAL (Afranio). Pontos de vista basicos na terapeutica do ophidismo.—*Mem. Inst. Butantan.* 1931. Vol. 6 pp. 243-249. English summary.

Do AMARAL (Afranio). O soro secco como cicatrizante das ulceras produzidas pelo veneno bothropico.—*Mem. Inst. Butantan.* pp. 253-265. With 2 figs. on 1 plate. English summary (6 lines).

and small animals, and that its severity—other things being equal—is inversely proportionate to the body weight of the victim. For this reason the volume of antivenene must be greatly increased if the patient be small. In cases of neurotoxic poisoning antivenene is advocated intravenously, whereas in venoms of proteolytic and haemorrhagic type the injection should be given locally into the tissues surrounding the fang punctures. The local application of dried normal serum is advocated for chronic ulcers resulting from snake bite. BESREDKA²⁸ also reports that local injection of antivenene is alone effective in the treatment of the cutaneous lesions following the experimental inoculation of viperine venoms in animals. GRASSET²⁵ found in sheep inoculated with Cape cobra venom that the longer serum treatment was delayed, the greater the dose of antivenene required to prevent death; further, the application of a tourniquet enabled the effective dose of serum to be reduced by from one-half to one-third, its localizing influence compensating to a considerable extent for the aggravating factor of delay in treatment. LLOYD²⁹ in Australia reports the recovery of a patient bitten by a tiger snake and treated intravenously with 4,500 units of the new monovalent antivenene recently produced by the Commonwealth Serum Laboratories. Another case, a child aged 2 years, bitten by a death adder for which no antivenene is as yet available, succumbed within two hours.

*N. Hamilton Fairley.**

²⁸ BESREDKA (A.). De la sérothérapie locale dans l'empoisonnement par le venin des vipères.—*C. R. Soc. Biol.* 1933. Feb. 3. Vol. 112 No. 4. pp. 345-347.

²⁹ LLOYD (C. Humphrey). Four Cases of Snake Bite.—*Med. Jl. Australia.* 1932. Sept. 17. 19th Year. Vol. 2. No. 12. pp. 360-361.

* Summaries of the German papers were made by Col. H. J. WALTON.

HELMINTHIASIS.

HEADLEE (W. H.). **Epidemiological Studies of Helminth Infections in an Egyptian Village. Soil Pollution and Soil Infestation.**—*Amer. Jl. Hyg.* 1933. Nov. Vol. 18. No. 3 pp. 695-711. With 4 figs.

The epidemiology of helminthic infections was studied at Rushdy, a village with 76 inhabitants in the Nile delta 16 km north and east of Cairo. This paper deals with part of the results obtained, namely defaecation habits, soil pollution and its infectivity, including the effects of climate and infection-favouring habits of the population.

The study extended from October to December and was repeated in May-June. Much care was expended in gaining confidence, co-operation and acquaintance with every inhabitant, so that even from a distance they could be identified through glasses by their familiar clothing. As a result there was obtained free access to the houses. At intervals there were periods of 6 consecutive days when every fresh stool was marked down and charted, these varied in number from 21 to 53, and their positions indicated no fixed defecation sites. Indeed the men commonly used the fields and the banks and beds of canals and when the last were filled for irrigation, the possibility of the spread of schistosome infection is clear. The number of fresh stools found was far smaller in summer than in winter, for during wheat-cutting in summer the men were in the fields before their morning defaecation. For detecting soil infection, Baermann's apparatus was used for larvae and the Caldwell-Spindler technique for ova (this *Bulletin*, Vol. 27, p. 975). Of 101 soil samples, which varied in water content from 3.8 to 50.7 per cent., 12 taken during summer were negative. Of 56 samples from spots of known pollution, 2 contained hookworm, 2 others doubtful, larvae, of 54 of them examined for eggs the findings were:—*E. vermicularis* 7, *Hymenolepis* sp. 4, ascaris 13 (1 unfertile), trichuris 1, hookworm 1, negative 32. Data regarding the other samples are not fully understood, but it is noteworthy that those from tops of 4 latrines all contained ova, namely ascaris 3, threadworm 2, trichuris 1. Habits as related to infective soil are discussed. The average annual rainfall for the area during 35 years is 34 mm. and the mean temperature in the months here concerned lay between 26.1 and 13.3°C. with maximum of 44.2 and 29.4°C. Stools were usually deposited in direct sunlight whose effect was increased by the way in which chickens scattered them about in the dust layer which covers all such spots. The beetles aid in their rapid disappearance. [A word of protest is permissible against the use of national spelling in the face of the existence of an internationally accepted Code of Zoological Nomenclature.]

Clayton Lane.

WIGAND (R.) & STEINER (F.). 'Weitere Untersuchungen ueber den Wurmbefall des Menschen am Kurischen Haff. [Worm Incidence in Man on the Kurisches Haff.]—*Deut. Med. Woch.* 1933. July 21. Vol. 59. No. 29. pp. 1119-1121.

Investigations at Schaaksvitte, on the southern shore of Kurisches Haff, are continued (see this *Bulletin*, Vol. 29, p. 404).

Infection with *Opisthorchis felineus* was confirmed. The following up of the population through a whole year showed that ascaris infection was greatest in the last quarter of the year corresponding, as in Panama, with a June acquisition; this is correlated by the authors with grosser filth in house and person every summer, particularly in respect of those of school age. In 33 persons with *diphyllobothrium*, eosinophilia varied from 0 to 14, the cause of this variation being undetected. No connexion was traced between tuberculosis and the wandering of ascaris larvae.

C. L.

MAHLER (K.). Die Beziehungen zwischen Helminthiasis und Frauenkrankheiten. [**Relations between Helminthiasis and Diseases of Women.**]*—Muench. Med Woch* 1933 Oct. 6. Vol. 80. No. 40. pp 1543-1545.

Mahler is convinced of the frequency with which gynaecological symptoms are due to worms.

At Insterburg, East Prussia, 28.4 per cent. of 500 patients showed worm eggs in the faeces, 131 coming from labouring and 11 from business class circles and most women with symptoms and worm infection had few or no physical signs. He insists that helminthiasis has a much larger rôle in gynaecology than is generally recognized and that the recognition and removal of worms will often be followed by surprisingly good results

C. L.

GALLI-VALERIO (B.). Notes parasitologiques et de technique parasitologique. [**Notes on Parasitology and its Technique.**]*—Zent f. Bakt* I. Abt. Orig 1933. Sept. 8. Vol. 129. No. 5/6. pp. 422-433 With 1 fig. [15 refs]

Among many notes on the geographical distribution of parasites is one recording the death of an extremely anaemic woman in the hospital of Elim, South Africa, no other cause being found than a mass of broad tapeworms. Though mature they were of small size, 24-40 cm. long, the mature segments measuring 4 mm. long by 2 mm. broad, the central rosette containing ovoid, yellow, operculated eggs 60 by 45 μ . They are considered to be *D. latum* var *tenellum*.

Under "Risk from parasites in transit" are recorded 3 cases in which foxes ingested and disseminated viable eggs of *Ascaris lumbricoides*.

Under "Technique" is noted the fact that eggs of *D. latum* kept in water at room temperature since 29.xii.1907 still have their characteristic form although many have lost the operculum

C. L.

CLAPHAM (Phyllis A.). **Recent Researches on Helminth Immunity.**—20 pp. [67 refs.] 1933. Imperial Bureau of Agricultural Parasitology. Winches Farm Drive, Hatfield Road, St. Albans. [3s.]

The author discusses natural immunity and acquired immunity, including the immunity produced by previous infestation, that produced by treatment with dead worms and passive acquired immunity. She discusses also the association of nutrition and immunity and reaches the following conclusions:—

"It is obvious that animals exhibit immunity responses as a result of helminth infestation, even though the immunity so produced seems seldom to be absolute. But it is manifested in decreased egg production, inhibited growth and lowered survival rate of the parasites. Then too the changes that are induced in the blood serum and in the body fluids are frequently demonstrated by the positive reactions obtained in diagnostic tests—complement fixation reaction, precipitin test. These tests are outside the scope of this memorandum but, being intimately linked with the immunity responses of the host, they must not be forgotten. It is interesting to call to mind in this respect that these tests have been successfully applied in the diagnosis of helminth infestations in both man and animals in a large number of diseases. For instance not only do schistosomiasis, hydatid disease, ascariasis in the migratory stages, etc., all give positive reactions with one or more of these tests but also both precipitin and complement fixation tests, according to Hoffmann and Rivers (1929), are useful in diagnosing fascioliasis in sheep in which the immunity response has not yet been considered.

"In summarizing these results we are bound to notice how very much of the evidence is contradictory. This is probably due to the different standards and criteria that are adopted by individual workers. It is obvious also that much more accurate data are necessary before we are able to understand the basic principles underlying the subject."

C. L.

CARMAN (John A.). Carbon Tetrachloride in the Treatment of Hookworm Disease and Taeniasis.—*East African Med. J.* 1933. Sept. Vol. 10. No. 6. pp. 181-186. [24 refs.]

"Now that its pharmacology and limitations are more fully understood, carbon tetrachloride can be confidently prescribed with safety if given to the right person in the right way." And again, "If certain classes of patients are not treated and if certain precautions are taken to encourage elimination and discourage absorption, carbon tetrachloride is a perfectly safe anthelmintic."

In support of his attitude Carman cites the long series of cases by LAMBERT [100,000 consecutive treatments without a death, this *Bulletin*, Vol. 30, p. 691], O'BRIEN [225,000 treatments in dosage of 1.2 cc. with oil of chenopodium with 3 independent deaths, this *Bulletin*, Vol. 22, p. 895], and KHALIL [150,000 treatments with 5 cc. as adult dose and one death and he an opium addict, this *Bulletin*, Vol. 23, p. 779], but omits all reference to other very different experiences such as those summarized in the note to LAMBERT's paper (*l.c.*). The contraindications to this drug mentioned are alcoholism, recent anaesthesia, coincident ascaris infection [which necessitates microscopical examination in every case], consumption of fat or oil, calcium deficiency [which, too, should imply personal tests]. Carman urges that a saline dose should be given before the anthelmintic, so that intracellular fluids in the intestinal mucosa are drawn lumen-wards, and by thus causing a negative osmotic pressure render difficult any absorption from the lumen. In *Taenia saginata* infection this drug may, by directly killing the parasite, cause its digestion, so that there may be cure without passage of segments. The dose advised is 60 minims [4 cc.] for an adult man, with grading for women and children. It is

noted that this dose now holds the sanction of the British Pharmacopoeia [but not that almost all deaths have followed smaller ones].

C. L.

TOMB (J. Walker) & HELMY (M. M.). **The Toxicity of Carbon Tetrachloride and its Allied Halogen Compounds.**—*Jl. Trop. Med. & Hyg.* 1933. Sept. 15 & Nov. 1. Vol. 36. Nos 18 & 21. pp. 265-270; 334-339. With 1 map in text.

The causes and treatment of poisoning by carbon tetrachloride are considered as displayed by 19 deaths in 1,600,000 persons treated for infection with *Ancylostoma duodenale* and *Ascaris lumbricoides* in the anthelmintic hospitals of the Department of Public Health of Egypt

First are considered the chlorine substitution products of the aliphatic carbons of which chloroform, carbon tetrachloride, tetrachlorethylene and dichlorethane have been used as anthelmintics, and against all of which it is noted in a valuable table that they cause acute hepatic necrosis. A paper by G. M. FINDLAY on Toxic Jaundice is quoted in which the causes of liver damage are set out, as are certain factors which influence its extent under the heads nutrition, combined toxic action such as the synergic effect of chloroform and *Bact. coli*, or of the arsphenamines and some infective agent, or of pregnancy with a drug.

Regarding carbon tetrachloride "In the opinion of CHOPRA and CHANDLER (with which we entirely agree), the condition of the patient as regards nutrition, diet and the presence or absence of liver damage, has much more to do with the toxicity of the drug than has the size of the dose. . . . A single large dose (as in the case of turpentine) is much safer than repeated doses owing to diminished absorption." As to the suggestion that the toxicity of the drug depends on carbon bisulphide or hypothetical and unidentified sulphur derivatives, reasons are given for the conclusion that it lacks all scientific foundation.

Of the 19 fatalities (1 in 84,000) 6 were immediate and 13 delayed. Regarding the 6 immediate fatalities the intervals between administration and death, the question of purgation, and the results of autopsy were: (1) 20 minutes, atheroma of coronary arteries; (2) 6 hours, purge and enema ineffective, cirrhosis of liver; (3) 3 hours, vomited purge, no autopsy, given with oil of chenopodium; (4) 1½ hours, cirrhosis of liver, given with oil of chenopodium; (5) 6 hours, purge unsatisfactory, cirrhosis of liver, many ascarids in intestine at autopsy; (6) 6 hours, bowels could not be moved, no contributing cause at autopsy. In the first 5 of these, ascaris infection only was revealed by microscopic examination and they were presumably treated for that infection; in the last, *A. duodenale* only was found and in it the history sheet revealed many unsuccessful attempts at evacuation by purge, enema and pituitrin.

In the 13 delayed poisonings the interval between administration and death lay between 2 and 3 days. In 5 the effect of the purge was not known; 3 were treated for ascariasis, of whom one died jaundiced without autopsy and the others showed acute hepatic necrosis and, severally, greatly enlarged liver and spleen, and fatty heart and kidneys with jaundice, two were treated for ancylostomes, both had acute hepatic necrosis, one hydronephrosis and the other was so feeble that he could not walk. In 6 the purge was deemed to have acted unsatisfactorily, in 1 no autopsy was made, in 5 there was acute hepatic

necrosis and, severally, unevacuated intestines, caseating mesenteric glands, chronic nephritis (he being the only one of the 6 who had not ascariasis), intestine blocked with ascarids, failure of purgative in a man absconding from hospital who had also received oil of chenopodium. In the other 2 the purge acted well, one was treated for ascaris and died jaundiced without autopsy but with the note "clinical contraindication (malaria)," the second was treated for ancylostomes, had enlargement of liver and was very weak and ill

"Since ascariasis is a contra-indication to the administration of carbon tetrachloride owing to the fact that in heavy infestations it is capable of causing mechanical obstruction to the action of the saline purgative through "clumping" of the worms in the intestines, it is now the routine practice in the anthelmintic hospitals of Egypt to administer a preliminary purge to all patients on the day on which they come for microscopical diagnosis and clinical examination. If found positive and clinically fit for treatment, they are directed to return on the following day, when, if they report that the preliminary purge has acted freely, carbon tetrachloride is administered in appropriate doses"

The dose used is 5 cc. (1 cc. for every 12 kilos), or, if a mixture of 1 to 3 of oil of chenopodium and carbon tetrachloride is used, 4 cc. (1 cc. for every 15 kilos). Stress is laid on a rich carbohydrate diet. "Since carbon tetrachloride must be regarded as a highly toxic drug if absorbed in therapeutic doses, it is particularly impressed on the staff of the anthelmintic hospitals that patients to whom carbon tetrachloride has been administered are to be regarded as in potential danger of death from poisoning by the drug until it has been completely evacuated from the intestinal canal." When symptoms of intoxication appear, intravenous injections of calcium gluconate are given, 30 cc. at once, and 20 cc. 3 hours later and thereafter every 4 hours as needful. The fatal effects of ascariasis are due, it is suggested, both to mechanical obstruction and to diminishing further the natural resistance either through toxins or by adding a burden to the bodily state already lowered by poor nutrition. The whole campaign is clearly based on an attempt to make an individual diagnosis and to maintain individual attention throughout treatment.

C. L.

ANDERSON (T Farnworth) & CAROTHERS (J. C. D.). **Two Fatal Cases of Poisoning with Male Fern.**—*East African Med. Jl.* 1933. July. Vol. 10. No. 4. pp. 122-123.

The dose of male fern given to both these adults for tapeworm, was 1190 (6 cc.) and since other patients receiving the same dose from the same bottle were not incommoded, idiosyncrasy is suggested as the cause of death.

Case 1 The dose was followed by transient fever, persistent vomiting, pain in the back, urine bloody with blood casts and epithelial cells, paralysis of arms, and death. P.M.—Gastric mucosa congested, gall bladder contained light-brown fluid, kidneys pale and swollen

Case 2 On November 22nd Oil chenopodium 1115 (1 cc.) On November 30th, after preliminary purge, the extract was given at 6 30 a.m. At 7 a.m. passed large quantity of tapeworm and blood, cold, shock, violent cramps in limbs, copious bleeding from gums, slight jaundice. At 1.30 p.m. coma, stertor, acetone in breath. Died 2 30 p.m. without rise in temperature. P.M.—Liver, spleen and kidneys intensely congested. Blood in kidney calices and bladder, and evidently suppression of urine of some hours duration.

C. L.

MEERSSEMAN (F), FRIESS (E) & BERGONDI (J). Un cas de distomatose hépatique à "*Fasciola hepatica*." Traitement par le tétrachlorure de carbone [Case of *F. hepatica* Infestation treated by Carbon Tetrachloride.]—*Bull. et Mém. Soc. Méd. Hôp. de Paris*. 1933. July 17 49th Year 3rd Ser No 24. pp. 981-984.

The diagnosis of *F. hepatica* infestation was microscopically established, the treatment effective.

A married woman of 30 with a nine years' history of nausea, migraine, subicterus, later, biliary colic with frank jaundice, and an itching eruption on hands, feet and buttocks associated with both colicky and migrainous attacks. Duodenal intubation, undertaken for treatment, disclosed many eggs of *F. hepatica*, after which they were discovered sparsely in the faeces, and an eosinophilia of 23 per cent was found. Biliary medical drainage and foudrin proved useless, as did agocholine and stovarsol. Carbon tetrachloride was given in dosage of 1 cc daily for 5 days. After the 3rd dose there was a violent biliary colic, with intense bilious diarrhoea burning the anus, but the course of treatment was continued. Another course was put through after 10 days and was associated with a milder crisis, again on the 3rd day. After this, ova ceased to be found by duodenal tube and the woman had gained weight and looked well. However, about 2 months after the beginning of the first course of treatment she had 3 others of 1 cc of carbon tetrachloride on each of 3 days, with a 5 days' interval between courses. Repeated examinations failed to find ova, and eosinophils fell to 3 per cent.

[In all, then, she had 19 cc of carbon tetrachloride. The diagnostic technique though concentrative in effect, actually obtained the eggs before they were diluted by food.] C. L.

KRULL (Wendell H). New Snail and Rabbit Hosts for *Fasciola hepatica* Linn.—*Jl. Parasitology*. 1933. Sept. Vol. 20. No. 1. pp. 49-52.

An investigation to determine the intermediate hosts of *F. hepatica* in the Rocky Mountain States.

"The snail *Fossaria modicella* Say has been determined experimentally to be a new secondary host of *Fasciola hepatica* Linn, and the cotton-tail rabbit, *Sylvilagus floridanus mullerus* (Thomas), to be a new primary host. Cercariae escaped from these snails which were subjected to infection when fully grown, in 32 days, but laboratory-raised snails infected when still small died before the cercaria-producing stage was reached. Laboratory-raised snails of the species *Succinea avara* Say and *Lymnaea (Galba) palustris* Müll and an opossum, *Didelphys virginiana* Kerr, could not be infected." C. L.

JEPFS (Margaret W.) Miracidia of the Liver Fluke for Laboratory Work. [Correspondence.]—*Nature*. 1933 July 29. Vol. 132. No 3326. p. 171.

A method of obtaining and developing eggs of *Fasciola hepatica*, held preferable to that of EALES (this *Bulletin*, Vol. 28, p 199), is described.

Rinsings from the gall bladders of infected sheep are washed several times, preferably with slow centrifuging, till clear. The sedimented eggs are thinly spread in dishes containing tapwater and set aside, the water being changed as often as it becomes foul. Miracidia will be present in

2-3 weeks at 25°C., 6-8 weeks at 16°C. Half an hour before miracidia are required for demonstration or infection of *Limnaea truncatula*, hatching is brought about by placing a drop of sediment in a watchglass full of cold water. Hyperinfection of snails must be avoided if the snails are desired to survive. Though it is generally stated that this infection is seasonal, no difficulty has been met in obtaining viable eggs at any time in the academical year at Glasgow (October to June) C. L.

KHALIL (Mohammed). The Life History of the Human Trematode Parasite *Heterophyes heterophyes* in Egypt.—*Lancet*. 1933. Sept. 2. p. 537.

The life history of the trematode parasite of man, *H. heterophyes*, has been worked out in Egypt.

The opportunity of investigation was offered by an endemic centre at Lake Manzala, adjoining Port Said, where 53 of 60 school children were found infected. The snail *Pirenella conica* contains lophocercous cercariae, one type of which was induced to encyst in *Gambusia affinis* reared in the laboratory. In the muscles 15-20 days later were found metacercariae with the characteristics of those naturally found in the mullet, *Mugil cephalus*; and three days after the infected gambusia had been fed to a young dog, born and reared in the laboratory, *H. heterophyes* of corresponding age was found in its intestine. The natural life history, then, is this—Passage of eggs into the water from many of 11,500 persons who operate the 1,325 fishing boats; infection of the very common *P. conica*; development of sporocysts, rediae and cercariae in it, maturing only during summer; entrance of free cercariae into the mullet or into *Tilapia nilotica*; the eating of these uncooked by man. Presumably the mullet is the main source of human infection, since it is commonly eaten salted; for the metacercariae are found living in the salted fish up to 7 days, and it is eaten from the third day onwards. C. L.

ARCHIBALD (R. G.). The Endemiology and Epidemiology of Schistosomiasis in the Sudan.—*Jl. Trop. Med. & Hyg.* 1933. Nov. 15. Vol. 36. No. 22. pp. 345-348.

Its title shows the paper's scope.

Since an alarming spread of schistosomiasis in the Sudan took place with the importation of Egyptian labourers in 1918, it is concluded that this country was originally infected by the Egyptian invasion of 2600 B.C. and the Egyptian occupation as far south as Kerma in Dongola Province from 2000 to 1000 B.C., seeing that RUFFER's investigations on mummies have shown that the infection existed among Egyptians during these periods. The author's further conclusions are as follows:—

"Schistosomiasis occurs in eleven out of the fourteen provinces in the Sudan; the vesical is the more common type in the northern Sudan, the greatest incidence occurring in males between the ages of 10 to 15 years. South of the Upper Nile Province intestinal schistosomiasis is the prevailing, if not the only, type.

"Infection is acquired during the months of the year when water is sufficiently shallow to permit of a high concentration of cercaria. In the case of inland lakes and water-courses, the seasonal incidence is from October to the end of January; in the Nile backwaters, the danger period is usually February to June.

"Laboratory observations have shown that *Bullinus truncatus* (including the species *B. contortus*, *B. dybowskii*, *B. innesi*) is the intermediate host of *S. haematobium* and *Planorbis boissyi*, *P. pfeifferi*, *P. alexandrinus* and *P. herbeni* the intermediate hosts of *S. mansoni*.

"Infected *Bullinus* and *Planorbis* molluscs are capable of shedding schistosome cercariae for periods as long as seventy-five and fifty-eight days respectively.

"Rapid desiccation readily kills *Bullinus* and *Planorbis* molluscs but in the drying-up of rain-water lakes and water-courses where the recession of the water is gradual, a certain number of molluscs are capable of aestivating in the subsoil for three to four months and so represent the seed stock for the following rainy season.

"Bovine schistosomiasis is fairly prevalent in the Sudan, the characteristic ova of *S. bovis* have not been found in the urine or faeces of natives of the Sudan."

C. L.

TSYKALAS (D.). L'émétine contre les affections schistosomiques. [Use of Emetine in Schistosomiasis.]—Extract from *Pratique Médicale*. 1933. May. No 8. 31 pp. With 7 figs. [Numerous refs.]

—. Décalogue de l'application de l'émétine.—Extract from *Ann. de E. Merck*. 1932. Pt. 3. 4 pp

Tsykalas claims credit for the introduction of emetine treatment in schistosomiasis and gives notes of 3,800 cases.

The present year is the 20th anniversary of the introduction of emetine in the treatment of schistosomiasis. Tsykalas claims the credit of its introduction on 14th June 1913 (Comptes-rendus de la Section de Médecine du Syllogue Hellénique d'Alexandrie, Ptolémée I.).

Emetine: its physiology, dosage and toxicology based on 3,800 personal cases.—An outstanding point here is the claim that emetine is superior to every other specific. Its dosage should be 1.12 gm., intravenously in all, spread over 10 injections during a fortnight—the first four of 0.1, 0.12, 0.14 and 0.16 gm., and the others of 0.1 gm. He also describes an abortive treatment of 1.0 gm composed of 0.1 on each of 10 consecutive days and claims for it a cure percentage of 90.5 comparing it with KHALIL's of 26 days 3 times a week with cure percentage of 32.5, FAIRLEY's 26 days also 3 times a week with 73.5 and the latter's 18 days daily of 100 per cent. of cures, the last two being experimental.

Attached to the reprint is an extract from Merck's *Annales*, 1932. Ten commandments in the use of emetine, of which, while there are none with promise, there are some with threat. They run something as follows:—

I. Give a total dosage of 1.25 gm. intramuscularly or 1 gm. intravenously. II. Spread it over 10–14 days. III. Begin with a big dose. IV. Give it every day. V. Regulate its size by body-weight and not by age. VI. Give it either intravenously or intramuscularly; it is immaterial. VII. Treat as soon as a diagnosis is made. VIII. Watch the heart; the risk lies there. IX. Leave two months between treatments. X. Let the emetine be pure.

C. L.

ARCHIBALD (R. G.). **The Use of the Fruit of the Tree *Balanites aegyptiaca* in the Control of Schistosomiasis in the Sudan.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. July 28. Vol. 27. No. 2. pp. 207–210

The widespread use of the fruit of *Balanites aegyptiaca*, and as a necessary preliminary the widespread culture of this tree, are believed to hold out good prospects for the control of schistosomiasis in tropical Africa, Arabia, Egypt and Palestine, these being the areas in which the tree grows naturally.

Experience in the Sudan has shown that schistosomiasis cannot be controlled there by measures directed to man only. Measures suitable for the irrigated Gezira (this *Bulletin*, Vol. 30, p. 207) are unsuitable for the West and South Sudan with their rainwater courses and rain ponds. The Arabs, in the arid west, resent chemical treatment of their only potable water, so a search was made for some tree shedding a fruit deadly for molluscs and harmless for man. It is believed that in *Balanites aegyptiaca* such a tree has been found. It fruits prolifically for 6 months annually, its date-like fruit with a bitter-sweet flavour is eaten with impunity, notably in the Upper Nile and Nuba Mountain districts. The berries, kernels, bark, roots and branches contain an active principle, probably a saponin (the bark is often used as a soap) which is deadly to molluscs, miracidia, cercariae, tadpoles and fish. For actual use the berry is advised; one weighing 5.2 gm. suffices to kill bilharzial molluscs when soaked in 30 litres of water. The advised procedure is: add 35 berries (they average 7 but reach 14 gm. in weight) to a 4½-gallon petrol tin of water and stand overnight, next morning thoroughly crush the softened pulp in the water, stand for 24 hours more, add this quantity of suspension to a cubic metre of water. At this dilution the fluid kills all *Bullinus* and *Planorbis* in 12 hours and bilharzial miracidia and cercariae in one hour or less. This suspension is a cheap, efficient and evidently acceptable substitute for chemicals, and it may well be obtained naturally if there is dense afforestation of the borders of natural water collections at present infective.

C. L.

ERFAN (M.). **Bilharziasis and Diabetes Mellitus.**—*Jl. Trop. Med. & Hyg.* 1933. Nov. 15. Vol. 36. No. 22. pp. 348–349. With 1 chart.

Although diabetes may be caused by schistosomiasis, such causation is rare.

Citing a case by DAY (this *Bulletin*, Vol. 21, p. 938) Erfan reports another, of *S. mansoni* infection, whose cure by intravenous tartar emetic coincided with a fall of urinary sugar from 10 per cent. to zero. The man took the ordinary hospital diet throughout.

C. L.

MACHATTIE (C.), MILLS (E. A.) & CHADWICK (C. R.). **Can Sheep and Cattle act as Reservoirs of Human Schistosomiasis?**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. July 28. Vol. 27. No. 2. pp. 173–184. With 6 figs. on 1 plate. [18 refs.]

To the question asked in the title the authors' answer is "No." Their argument runs thus:—

In 1876, in a letter to PANCERI, SONSINO described from the ox *Schistosoma bovis* indistinguishable from *S. haematobium* except that it had an intestinal and portal habitat and that the eggs were fusiform and not ovoid. In reading this letter PANCERI prefaced it with the remark that it opened the way to investigation of the bovine haematuria which occurred round them. This has generally been accepted as a statement that *S. bovis* had a urinary habitat, while in fact SONSINO found no evidence of this infection in the bladder. When VEGLIA and LE ROUX (1929) named *S. mattheei*, they wrote that the new species had "never been found invading the uro-genital organs nor producing lesions as recorded for *S. bovis* by SONSINO [whom they had been unable to consult], KHALIL and others." In 1921 CAWSTON submitted specimens to LEIPER and these seem to have been identified by him as *S. bovis*. CAWSTON visited Humansdorp, where VEGLIA and LE ROUX obtained their specimens of *S. mattheei* from cattle and sheep, and recovered schistosomes from a sheep, which FAUST identified as *S. bovis*. The egg illustrated by BLACKIE as that of *S. mattheei* is indistinguishable in shape and size from that of *S. bovis*. MacHattie and Chadwick (1932) have shown that a diseased *S. bovis* may produce eggs corresponding in shape and size to those of *S. haematobium*. VEGLIA and LE ROUX claim that *S. mattheei* can regularly produce a mixture of eggs of *S. bovis* shape, of *S. haematobium* shape, or intermediately shaped. "It would appear that BLACKIE has failed to produce any convincing evidence in support of his statement incriminating cattle and sheep as constituting a potential reservoir of human urinary schistosomiasis. One of the great difficulties in the elucidation of this problem is the desire on the part of workers to create new species on what to us appear to be the most trifling variations—variations which in other members of the animal kingdom would be considered as of no significance."

In support of these conclusions, with their wide and important hygienic implications are the finding of spindle-shaped eggs in man in areas where *S. bovis* does not occur in cattle; variation in distribution of vitellaria of *S. bovis* in 4,000 specimens examined; differences in intrauterine size of eggs from 90–205 μ by 36–62 μ , the illustration of consecutive eggs from a uterus, one *S. bovis*-shaped, the other *S. haematobium*-shaped (photographed); immature eggs of *S. haematobium* from human urine showing marked elongation and spindle-shape (photographed); the failure of *S. haematobium* to infect sheep and of *S. bovis* to infect man, and the recovery of a female *S. haematobium* measuring 28 mm. long and having 106 eggs in the uterus from a man of 82, and the suggestion that this specimen actually represents a female which has lived long enough to become fully developed.

C. L.

LEFROU (G). Présence de *Bullinus dybowskyi* au Sénégal. La diagnose des *Bullinidae* africains. [Presence of *B. dybowskyi* in Senegal].—*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. pp. 1099–1105.

The title indicates the paper's scope.

A long quotation is given from ADAMSON, who was in Senegal from 1749 to 1753, describing the *Bullinus*; as are diagnoses of the sub-genus *Isidora*, of *Bullinus* (*Isidora*) *dybowskyi*, *B. (I.) innesi*, *B. (I.) tropicus*, of the subgenus *Pyrgophysa*, of *B. (P.) forskali*; of the genus *Physopsis* and of *P. africana*.

C. L.

MAGATH (Thomas B.) **The Relation of *Diphyllbothrium latum* Infestation to the Public Health.**—*Jl. Amer. Med. Assoc.* 1933. July 29. Vol. 101. No. 5. pp. 337–341. With 1 fig. [17 refs.]

The paper refers to the United States where, as predicted by STILES 26 years ago, *Diphyllbothrium* infection has become endemic. Magath points out that three-quarters of the reported cases have come from the central lake region and two metropolitan regions in the East to which fish from the lake region are shipped. Reasons are given for the belief that man is the essential definitive host, infection being spread to the intermediate hosts by his sewage. Of 25 cases seen at the Mayo Clinic none had anaemia which, it is pointed out, adds weight to the conclusion that the worm acts merely as a trigger. For prevention the author's advice is as follows:—

"1. All sewage should be treated with some killing solution, such as formaldehyde or chlorine, before being discharged into lakes or streams.

"2. People should be taught the necessity of thorough cooking of fish. 'Gefüllte' fish should not be tasted during preparation for the table.

"3. It has been demonstrated by Kjava and by Magath and Essex that submitting infested fish to temperatures of -10°C . for from twenty-four to forty-eight hours kills the larvae. Therefore freezing methods should be instituted in commercial houses that pack susceptible fish obtained from lakes known to be polluted.

"4. Some system should be inaugurated for reporting human cases of infestation and isolating the infested persons until they are freed of the worm.

"5. Stools of all Baltic immigrants should be examined.

"6. A campaign should be undertaken to prevent feeding dogs with raw fish of the varieties known to be susceptible to infestation with *Diphyllbothrium latum*.

"7. Further surveys of lakes and streams should be made in order to discover the extent of infestation of fishes." C. L.

YOKOGAWA (S.). **Report on Experiments with *Sparganum mansoni*, undertaken in an Endeavour to clarify the Nature of *Sparganum proliferum*.**—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1933. Aug. Vol. 32. No. 8 (341). [English summary pp. 114–116.]

Yokogawa's experiments do not enable him to pronounce either for or against the identity of the two species of sparganum, though he personally doubts their independence.

S. mansoni has been studied sufficiently exactly to establish two unique features: (1) when the plerocercoid is removed from one intermediate host and fed to another which cannot act as a definitive host, it leaves the digestive tract and continues to grow as a plerocercoid; (2) a plerocercoid placed for a few days in normal saline disintegrates all but the head, which in a suitable intermediate host proceeds to grow. Accordingly the question arose as to whether the prolonged application of mechanical or chemical stimuli could not induce the appearance of *S. proliferum* in *S. mansoni*.

Transference of normal or mutilated worms was made by swallowing or transplantation into over 80 experimental animals. When transplanted the worm migrates. If cut in pieces transversely the head and one or more adjacent pieces live, the others die, and with death in the subcutaneous tissues there is much inflammation with caseation. After transference of *S. mansoni* into an experimental animal there were subsequently found in this host fewer worms in 52 cases, the same number in 18, and more in 7, the figure being without relationship to the interval since transference. Nor did those with increases show any morphological peculiarity. Diminution in numbers was chiefly due to acute inflammation, pneumonia or septicaemia, and plerocercoids in an inflammatory focus were always remarkably shrunken and deformed. As to causes of increased numbers, they appear to originate from the head and can possibly be induced by stimuli. Intravenous injections of grape sugar or calcium chloride had no observed relation to proliferation, nor did a tendency to do so in one host continue if the worm was transferred to a second; indeed a deformed specimen generally returned to normal shape after transplantation into a fresh animal. No membranous covering enclosed the 7 forms which tended to proliferate, though it was sometimes seen with dead or dying worms, while the mode of proliferation seemed very different from that of true *S. proliferum*. C. L.

YOSHINO (K). **Studies on the Post-embryonal Development of *Taenia solium*. Part I. On the Hatching of the Eggs of *Taenia solium*—***Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)* 1933. Oct. Vol. 32. No. 10 (343) [In Japanese pp. 1392-1409 With 3 figs. & 1 plate. [18 refs.] English summary pp. 139-141.]

These minute studies on the hatching of the eggs of *Taenia solium* were carried out on material obtained by autoinfection.

In intestinal, but not in gastric, juice the shell disintegrates, apparently by solution of a cement which connects the rod-shaped elements which compose it. The freed onchosphere shows in intestinal juice active movements of the hooklets and body; the former it is held scratch a hole in the membrane with which it is still surrounded. After escape through this hole, the movements of hooklets cease but amoeboid movements are obvious. The hooklets are described as existing in any even number from 6 to 18 and their relative positions and movements are exactly detailed and their measurements given.

C. L.

SHORB (Doys Andrew). **Host-Parasite Relations of *Hymenolepis fraterna* in the Rat and the Mouse.**—*Amer. Jl. Hyg.* 1933. July. Vol. 18. No. 1. pp. 74-113. With 4 charts. [14 refs.]

The many important implications displayed in this comprehensive work are set out in the author's summary:—

"The study of *Hymenolepis fraterna* was undertaken to determine the relations of the parasite to its host, the black-hooded laboratory rat and the albino mouse. In all, 875 rats and a similar number of mice were used in experiments with results from which certain conclusions can be drawn. Two strains were used, the W strain obtained from wild rats and the M strain from white mice

"1. The eggs of *H. fraterna* are most viable at the time of passage from the host. From that time the viability when stored in water decreases till lost completely by the eleventh day. Salt flotation for isolating eggs appears to have no effect on their viability.

" 2 The prepatent period is from 11-16 days for the W strain in rats and 15 days and over for the M strain in mice. The worms grow rapidly after the cysticercoid stage till mature. At that time they vary in length from 3-240 mm. The size of the worms on the seventh and eighth days of infestation seems to show effects of resistance of the host, as the more worms present at that time, the larger they are. From the thirteenth day on, however, the size of the worms is affected radically by the number present and the smaller worms are found in the larger infestations. Egg counts and Lane examinations [D C F] show that the period of egg production is very short in animals infected with a single dose of eggs, ranging from one to 11 days, while daily autopsies show that the loss of worms from the thirteenth day on after infection, is rapid and constant.

" 3. The natural transmission of *H. fraterna* was studied by placing a number of infected and non-infected rats in a cage when they came in contact with their own feces. This worm is transmitted easily from one rat to another under these conditions. Most of the rats were infected repeatedly. Evidence of age resistance and superimposed infestation is also shown by results of this experiment.

" 4. The average development of eggs of *H. fraterna* in rats and mice is less than 1 per cent. In rats, when very large numbers of eggs are given at one time, there is some evidence that the worms are thrown out due to a host reaction.

" 5. There is an initial resistance found in rats and mice during the period of nursing which is lost a short time thereafter. In older animals not previously infected there is a resistance which is gradually built up to a point where rats are highly resistant at five months and mice are much less susceptible at seven months than at two.

" 6. There is a distinct resistance to superimposed infestation found in both rats and mice but especially in mice, although it is possible to superimpose infestations in either.

" 7. The two strains of the dwarf tapeworm used in this study proved to be distinctly different. One, the W strain obtained from wild rats, was almost equally infective for rats and mice and the other, the mouse (M) strain, was distinctly more infective for mice than rats. This is shown by the worms of the M strain developing faster and to a larger size and also producing a larger incidence and worm burden in mice than in rats. The difference between these strains is striking in mice but in rats, which are almost immune to the mouse strain, it is much more evident. The discovery of these two strains which seem no less different from each other than the human and rodent forms of the dwarf tapeworm make it seem possible that *H. fraterna* might be considered synonymous with *H. nana*.

" 8. A diet consisting of white bread and water reduced the resistance of rats to the non-specific strain (M) and also the resistance connected with age. On the other hand the worms will not develop to maturity in mice on this diet."

C. L.

KIRIBAYASHI (Shigeru). **Studies on the Growth of *Hymenolepis nana*, with Special Reference to the Possibility of Differentiation of *H. nana* var. *fraterna* (Stiles).**—*Taiwan Igakkai Zasshi* (Jl. Med. Assoc. Formosa). 1933. Sept. Vol. 32. No. 9 (342). [In Japanese pp. 1175-1190. [22 refs.] English summary pp. 117-118.]

The English summary of these studies on the growth of *Hymenolepis nana* is not very clear but its principal conclusions seem to be the following:—

" *H. nana* of human and *H. nana* var. *fraterna* (Stiles) of rat origin can be established directly in white mice or rats without any intermediate host.

" In the direct infection experiments with *Hymenolepis*, both of human and rat origin, I could find no difference in development and structure in the various stages from the encapsuled or free larva to the young or adult worm.

"Hymenolepis, both of human and rat origin, can be established directly in man, especially in a small child, by ingestion of the egg. I could not find any difference between either the larvae or the adults of the two forms if they were obtained from one host.

"The length and width of the worm may differ according to the host, but they are the same in the same host and correspond biologically and morphologically. Therefore I conclude that *H. nana* of human and *H. nana* var *fraterna* (Stiles) of rat origin cannot be differentiated." C. L.

ADAMS (A. R. D.). **Two Further Cases of Human Infestation with *Bertiella studeri* (Blanchard, 1891) Stiles and Hassall, 1902, with Some Observations on the Probable Synonymy of the Specimens previously recorded from Man.**—*Ann. Trop. Med. & Parasit.* 1933. Oct 21. Vol 27. No 3. pp. 471–475. [12 refs.]

These two new cases of *Bertiella* infestation, recorded from Mauritius, raise the number of reported human cases to nine. Only *B. fallax* is believed to have specific characters which undoubtedly differentiate it from *B. studeri*, the type species.

After discussion of the described characters of the various supposed species, Adams points out that his two specimens have markedly bilobed vitelline glands, a feature not apparently stressed in recorded descriptions but one which appears to him of more importance than a number of the minor differences in the structures of the genitalia which have received considerably more attention. Accordingly he endorses MEGGITT'S and SOUTHWELL'S views on synonymy, more particularly regarding *B. satyri*, *B. mucronata* and *B. polyorchis* as synonyms of *B. studeri*. C. L.

DIXON (H. B. F.). **Two Cases of Cysticercosis (*Taenia solium*).**—*Jl. Roy Army Med. Corps.* 1933. Aug Vol 61. No. 2. pp. 126–128.

These cases are of interest in relation to Col. MACARTHUR'S study of cysticercosis as a cause of epilepsy in man [this *Bulletin*, Vol. 30, p. 680].

"These two cases illustrate how necessary it is to view with suspicion all alleged idiopathic epilepsy occurring in soldiers, aged 24 to 26, who suddenly develop fits in the later years of their service overseas.

"The character of the fit is not really of importance as fits caused by the *Cysticercus cellulosae* may simulate a true idiopathic epilepsy, the important fact is that the epilepsy usually manifests itself between the 22nd or 24th year.

"It will be noted that neither of these cases gave a history of tapeworm."

C. L.

MACARTHUR (W. P.). **Cysticercosis and Epilepsy.** [Correspondence.]—*Brit. Med. Jl.* 1933 Oct. 14. p. 711.

To aid an investigation on the connexion of cysticercosis and epilepsy in the Army, any diagnosis of cysticercosis in an ex-soldier should be notified to Col. MacArthur. C. L.

MAPLESTONE (P. A.). **The Frequency of Hydatid Disease in India.**—*Indian Med. Gaz.* 1933. July. Vol. 68. No. 7. pp. 377–379.

Evidence suggests that hydatid disease is commoner in India than the records in medical literature indicate.

Its relative rarity Mapleson attributes certainly in part to the fact that in India the dog is not the companion of man, but also to the consideration that scarcity of animal food forbids the casual throwing of liver and lungs to dogs; and finally to climate, so falling in with Australian experience where the infection is greater in the cooler south than in the hotter north. He records 20 cysts in all, an addition of 4 to the Indian literature; compares these percentages with those of Dévé compiled from 2,727 cysts; points out that from their very different totals the series are not comparable; and suggests that since, of the 20, one each was found in breast, kidney, spleen and cellular tissue, the probabilities are as stated in the opening sentence. C. L.

LÓRINCZ (F.). Die Rolle der Katze in der Verbreitung der Echinococcus. [The Role of the Cat in the Spread of Hydatid.]—*Zent. f. Bakt.* I. Abt. Orig. 1933. July 11. Vol. 129. No. 1/2. pp. 1-11. With 30 figs. [11 refs.]

The author's experimental work brings him into sharp disagreement with the statement that the cat is an agent in the dissemination of hydatids.

He has used 11 dogs and 51 cats. In the former, development was normal, maturity being reached in 36 days, in the latter slower, with complete failure to reach sexual maturity, and in them diarrhoea was a common symptom. Moreover, while infection persisted in all the dogs until they were treated after 5 or 6 weeks, 14 of 31 cats carefully examined relieved themselves spontaneously of the infection. The question is raised whether in those instances where *E. granulosus* has been reported in cats, a different species or a biological variety has not been in question. C. L.

PLAZY (L.) & DAMANY (P.). Cancer primitif du foie chez un noir porteur de kystes hydatiques. [Primary Liver Cancer in an African with Hydatid Cysts.]—*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. pp. 1015-1018.

A Senegalese, after 4 years in Morocco, died in Toulon of a primary carcinoma of liver situated about a hydatid cyst.

This hepatic cyst was crammed with daughter cysts, while a second one in the caecal region contained hooklets. In the liver a cirrhotic meshwork enclosed carcinomatous masses which had passed through the diaphragm and caused pleuritic effusion, and had matted together the viscera in the upper abdomen, including an enlarged but not cancerous spleen, and had filled the abdomen with fluid. Both effusions were deeply bloodstained. Eosinophilia was absent from the blood and not notable round the hepatic hydatid. It is pointed out that in Africans both French and other observers have reported that primary cancer of the liver is relatively common. It is felt that the hydatid cyst played a part in its origin in this case. C. L.

BONNAL (G.), JOYEUX (C.) & BOSCH (P.). Un cas de cénurose humaine dû à *Multiceps serialis* (Gervais). [Coenurosis in Man due to *M. serialis*.]—*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. pp. 1060-1071. With 1 text fig. & 7 figs. on 2 plates. [14 refs.]

A sixth case of infection is reported of which the first two by ROLFINKE in 1656 and KLENCKE in 1844 are of doubtful validity.

A woman of 59 who had never been out of France but was a dog lover had, when seen, a tumour in the right buttock which, as she stated with insistence, had wandered thither from the right thigh. Eosinophils 9. No intradermal or complement fixation antigen reactions. Under a local anaesthetic a tumour 90 by 35 mm. and weighing 250 gm. was removed. It is closely described. About half the scolices were malformed. When part of the cyst was fed to a dog of a year old, which had been segregated for some time, seven scolices had developed when this was killed 12 days later. They measured 12 to 35 mm and possessed 35 to 78 segments with irregularly alternating genital pores, the usual taenia arrangement of genitalia and hooklets like those of the embryo—namely an average of 2 rows of 16 each, averaging themselves in length 142μ and 100 to 105μ . A table gives the number and size of these in 13 species of *Multiceps*, and from the consideration of geographical locality, a feeding experiment, habitat, appearance of the cysts, and the characters of the hooks it is identified as *M. serialis*. The hosts of this parasite are enumerated (the definitive in general and the intermediate in detail) and the 5 previous cases are noted with their references in literature [see also this *Bulletin*, Vol. 29, pp. 54 & 416].

C. L.

DÉVÉ (F.). La souris blanche, animal réactif pour les inoculations échinococciques. Un essai de sérothérapie anti-échinococcique aspécifique. [Use of White Mouse for Experimental Inoculation of *Echinococci*: Serotherapy.]—*C. R. Soc. Biol.* 1933. Vol. 113. No. 28. pp. 1443–1445. With 1 fig.

White mice are readily infected with echinococci, but the treatment used did not prove effective.

Injection of "hydatid sand" subcutaneously is an uncertain method of producing infection; intraperitoneal injection is certain and results in widespread dissemination of cysts of a size rather less than that of a successful subcutaneous experiment. This circumstance provides a ready means by which therapy can be tested. Injection of serum from the street dog, that is to say one infested by various kinds of taenia, has not prevented infection in white mice, even when given in quantities which weight for weight correspond to 2 litres in a man of 60 kilos.

C. L.

PETRUSCHEWSKY (G. K.) & TARASSOW (Viktor). Versuche ueber die Ansteckung des Menschen mit verschiedenen Fischplerocercoiden. [Experiments on Infection of Man with Various Fish Plerocercoids.]—*Arch. f. Schiff- u. Trop.-Hyg.* 1933. Aug. Vol. 37. No. 8. pp. 370–372.

The authors point out that confusion has occurred owing to incomplete descriptions of plerocercoids which have been identified as those of *Diphyllbothrium latum*. These last actually occur in *Esox lucius*, *Lota lota* and *Perca fluviatilis*. But another kind of plerocercoid, called by the authors "Type B," has been confused with it. This forms a characteristically rounded cyst on the outside of the intestinal wall, the worm has a pointed head without a cleft at the hinder end and a smooth cuticle, the movements are weak; when fed to man from *Thymallus thymallus*, *Osmerus eperlanus*, *Acerina cernua* and *Coregonus*

albula, and to kitten and puppy from *O. eperlanus*, no infection followed. In identification of plerocercoids from fish, other than the 3 species first mentioned, there is then needed a detailed description and detailed transmission experiments. Of 28 plerocercoids of *D. latum* which were consumed 23 developed. The average daily rate of growth in pups is 1.3 mm. in the first days and 47 mm. later and in May 150 mm. daily. In one dog a second infection was induced, apparently 30 days after the first. A plerocercoid from the muscle of the "Kaulbarsch" or ruff, a species of perch, is that of *D. latum*.

C. L.

PRUIS (G. W. A.). Over ascariisintoxicatie [*Ascaris Intoxication*.]—*Geneesk Tijdschr v Nederl-Indië* 1933. May 23. Vol. 73. No 11. pp 685-690. With 3 charts.

The mechanical effects produced by ascarids in their wanderings through the body are highly important and are referable to the organ involved. That the symptoms produced are exclusively explainable on this basis is questionable and the possibility of production of a toxic substance by the worm itself, or by absorption after the death of the worms, is considered. Two cases of patients are described suffering from pyrexia and other symptoms, in one of whom there might even have been a fatal issue, and emphasis is laid on the disappearance of toxæmia as soon as the worms were evacuated. The author, however, contents himself with concluding that two cases, although suggestive, are not sufficient to support his contention of an ascariis intoxication.

W. F. Harvey.

[Evidence by Sir Patrick HEHIR and others for the existence of an ascariasis fever will be found in the *Indran Medical Gazette* for 1910-11. Moreover, when the commentator took over responsibility for lying-in cases at the Eden Hospital, Calcutta, in 1900, he found that the routine treatment for a post partum fever without apparent sepsis was santolin and that it appeared justified by its results.]

C. L.

ASHFORD (Bailey K.), PAYNE (George C.) & PAYNE (Florence King). **Acute Uncinariasis from Massive Infestation and its Implications.**—*Jl. Amer. Med. Assoc.* 1933. Sept. 9. Vol. 101. No. 11. pp. 843-847.

An important and, in its thoroughness, unique description of a small epidemic of acute ankylostomiasis, a neglected condition and in this case actually acquired during sea bathing. *A. duodenale* was the agent, a hookworm at least rare in Porto Rico.

Infection followed sea bathing at the place and time when a stream was discharging turbid flood water into the sea. Examinations covered a whole year and comprised haemoglobin estimations, blood counts including differential counts, and Price Jones curves daily for about a month, every 2 or 3 days for about 2 months more, and every week or two afterwards. Worm counts in large numbers were also made. The patients were still anaemic at the time of the report, though the authors were satisfied that intestinal worms were absent, the condition being attributed to strayed larvae. Full protocols are in the press and will be published shortly.

In the meantime the following points are made. The patient first seen (Case 1) had fever and intestinal haemorrhage and the diagnosis was typhoid with delayed agglutination. Nevertheless Ashford when consulted was dissatisfied, and from a consideration of all matters believed the trouble to be acute ankylostomiasis. Ova, 200 per gram, were seen for the first time a week later, on the 49th day; and by another week had risen to 26,500. Her blood loss into the intestine was so severe as to necessitate 3 blood transfusions.

Briefly, 6 of the 7 patients bathed in the sea during tropical rain which was at that time and place washing into it large quantities of muddied fresh water from a long-stagnant stream. All but one of them (she had remained in the water a relatively short time) found when they came out that the entire trunk under the bathing suit was peppered by small bites. Itching prevented sleep that night. A week later there was a feeling as if cold had been caught, with pain on speaking and swallowing. In another week there developed weariness, colic, diarrhoea, dark foetid stools with obvious or occult blood. Case 7 had not bathed but had earlier delved with her hands on the banks of the stream itself, a confirmation of the source of the infection. The table here compiled gives some details of the cases.

Case	Minimum		Maximum eosinophilia	Number of treatments with		Worms passed	
	haemoglobin	erythrocytes		caprokol	carbon tetra- chloride	spontan- eously	total
1	17	1,256,000	78	4	4	64	1,439
2	42	2,240,000	87	2	5	32	614
3	65	3,744,000	74	3	3	1	64
4	68	4,192,000	88	3	3	9	125
5	55	3,936,000	72	1	2	8	59
6	60	3,720,000	62	1	2	0	21
7	60	3,824,000	91	1	2	0	7

Treatment was firstly restorative in Case 1. Secondly it was anthelmintic and the authors "comment on the effects of caprokol (hexyl-resorcinol), a somewhat new and infrequent anthelmintic in uncinariasis. We consider a full dose 2 gm., . . . but in case 1 we did not exceed 1.4 gm. In several of our cases . . . it seemed to produce nausea and even vomiting, but it appeared to cause no other deleterious effect and was certainly efficient." [Would or would not other anthelmintics have merited this last commendation in these repeated doses?] Ferrous carbonate in large doses was given to rebuild haemoglobin.

The authors do not stress the matter, but in the face of the strongly urged dictum that light infections are harmless it is well to point out how definite were the ill effects produced by seven intestinal hookworms, and to emphasize the care which was exercised in worm counts, as evidenced first by the numbers which were detected before any anthelmintic was given, and secondly by the fact that some were as small as 1.8 mm. long. It may be added that males preponderated and that the worms were very often filled with blood. It is *inferred* that these

ill-effects (which were markedly persistent even a year after infection and even when as few as 7 worms in all were found) were due to strayed larvae "When most of the worms in the intestine had been expelled the percentage [of eosinophils] rose; but this was not on account of the expulsion of the worms. . . . The eosinophilia rises when the larval mortality in the tissues rises . . . towards the end of the third month from the time of the original invasion of the skin." [If this prove true, the too popular measurement, of ill effects in hookworm infection, on a scale of intestinal worm loads becomes even less defensible than it at present is.]

Referring to the Porto Rico Anaemia Commission of 1904 the authors comment :—

"Since that time hookworm disease has become, at least in the popular fancy, a public health problem relegated to the specific attention of sanitarians, and what was, at the time we were working, a disabling and very often fatal disease has become apparently merely a routine matter for health officers to settle.

"It is for the purpose of re-arousing the medical profession to a just conception of one of the great tropical diseases, as well as to corroborate a phase of uncinariasis on which few if any comments have ever been made and further suggest that there is probably still another and more sinister aspect of what has seemed such a simple illustration of parasitic invasion, that we have decided to break a silence of twenty-five years on a subject that seems for some time to have been considered closed and completely investigated."

[It is delightful to have Colonel Ashford again actively interested in hookworm infection after this great interval, and to read his endorsement of the conviction that more work is greatly overdue on this most important infection.]

C. L.

GRANT (Alan M. B.). **A Short Note on the History and Elimination of Hookworm at Nauru.**—*Med. Jl. Australia.* 1933. June 17. 20th Year. Vol. 1. No. 24. pp 733-734.

"I feel that no infected person examined could have escaped this drag-net of diagnosis, and that we are justified in saying that hookworm has been almost eradicated from the Nauruans."

This island lies close to the equator with a central lagoon surrounded by damp, shady, fertile soil, and with a sandy quick-drying foreshore. There are 1,500 Nauruans and 1,000 Chinese labourers; the latter with their 3 years' contract being wired in, given mass treatment, and allowed out only to work. The paper is not concerned with them. Among 1,000 Nauruans Willis's technique displayed hookworm and whipworm eggs in 89 and 25 per cent. respectively round the lagoon, and in 41 and 50 per cent. about the foreshore. The anti-hookworm measures adopted were: deep pit latrines with concrete covering slab, raised concrete platforms for houses, and the giving of a number of mass (? herd) treatments with a mixture of carbon tetrachloride and oil of chenopodium in liquid paraffin. Subsequent diagnosis was by Barber's glycerine saturated salt method, and by culture, which was in effect trapped, both methods being used in all cases. In about 700 persons examined only one case of hookworm infection was then detected (in the Lagoon district) but in this area trichuris infection was found in 65 per cent. and in the foreshore area in 35 per cent.

[Owing to the way in which glycerine clears hookworm eggs and causes them to disappear while enhancing the visibility of trichuris eggs, the two surveys are, it is suggested, not comparable] C. L.

AHMANN (C. F.) & BRISTOL (L. M.). **The Effect of Diet on the Worm Burden of Children infected with *Necator americanus* and *Ascaris lumbricoides*.**—*Southern Med J* 1933. Nov. Vol. 26. No 11 pp. 959–962. With 2 figs.

Used under certain stringent conditions Stoll's egg-counting method has been found accurate to within less than 5 per cent. and demonstrated as a satisfactory measure of worm load. Ascaris infection has disappeared under observation, and hookworm infection has trended to reduction, with, on improving the diet, a marked decrease of egg counts in one case, and a less marked change in another.

For Stoll's egg-counting, a period of training covering about 50 slides was necessary before one worker consistently counted as many eggs on one slide as did the other. After citing experiments, it is added: "From these results it can be seen that this method is sufficiently reliable for following the change in worm burden when an average of 4 or more counts from the same dilution is used."

Two children were followed by egg counts from April to January, and one from April to July. During the first 4 months their food, in a detention home, lacked milk, fresh vegetables and fruit; during the last 5 months these and cod liver oil were provided daily for two of them, the third ceasing to be followed after having shown no change in hookworm egg counts during this observation period. Of the two, B.P. showed a slightly higher and M.P. a slightly lower egg count for hookworms at the end than at the beginning of this period; or, as the authors put it, the one showed no decrease in the worm burden, while the other showed a slight decrease in that burden. In both children the ascaris counts fell.

Under the extra diet B.P.'s egg counts fell for 3 months and after a severe intestinal disturbance rose 5 weeks later to the highest level recorded, "apparently due to reinfection"; while M.P.'s count fell appreciably in the second month when the child developed definite symptoms of reinfection, and by the third month of the experimental period the count was higher than at any time during the control period, there being a slight drop later, in both cases ascaris ova disappeared.

[The authors' assumption that egg counts are a measure of worm loads is untenable. To take this question of diet alone, FORSTER and CORT (this *Bulletin*, Vol. 29, p. 762) showed that a change, in this case a worsening, in diet increased egg counts of *A. caninum* from 500 to 1,000 per cent. in conditions in which these latter writers were satisfied that reinfection could be excluded. Further the assumption here that increased egg counts in M.P.'s case implied reinfection appears to give a preadult period of under 4 weeks, one shorter than has been definitely noted for the hookworms of man.] C. L.

DE LANGEN (C. D.) & EERKENS (J. W.). **Nephroses and Ancylostomiasis.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. July 28. Vol. 27. No. 2. pp. 195–198.

The authors have met nephroses frequently in Java and find a connexion between them and ankylostomiasis.

Having noted that, among the many patients admitted to their hospital with oedema, some fulfilled all the diagnostic essentials of

nephrosis, and that most of the latter group had hookworm infection, the authors made detailed studies of 20 such cases admitted during 10 months and found 17 so infected. The average infection rate among all patients, presumably to the same but unstated technique was about 50 per cent. All these 20 had casts, and these were still being passed when they were re-examined 1 to 8 months after deparasitization was judged to have taken place. The 3 negative cases came from heavily infected districts, 2 of them having positive Wassermann reactions and owing to lues. Of 181 patients with kidney trouble treated at the Central Public Hospital, Batavia, it appears that 50 had nephrosis. Of these 50, 37 showed ova, 8 were negative but were examined once only and came from heavily infected districts, 4 were negative to repeated examinations and the other one had diabetes. In Keboemen Hospital, where practically all patients were infected, there were 74 cases of nephrosis to 13 of nephritis. At Bandoeng, where infection is not particularly common there were 27 with nephritis and 15 with nephrosis. Of the latter 7 had hookworm infection, 3 lues, 1 quartan malaria, while the other 4 are described as "nephroso-nephritics."

C. L.

SFAMENI (Antonino). L'anchilostomiasi nella provincia di Messina. [*Ankylostomiasis in Messina.*]—*Riv Sanitaria Siciliana*. 1933. July 15. Vol. 21 No 14. pp 1096, 1099-1100, 1103-4

Brief notes are given of ten patients resident at Messina, three in one family, two in another, with somewhat vague complaints of debility or intestinal disturbance, in whose faeces hookworm ova were found. The cases were quite straightforward and cleared up after treatment with thymol.

The author states that he has read that carbon tetrachloride is good for ankylostomiasis, but that too many precautions appeared to be necessary to avoid its toxic effects.

H. H. S.

STILES (Ch. Wardell) **The Nurse's Opportunity in Hookworm Disease.**—Reprinted from *Public Health Nursing*. 1933. Aug. 4 pp.

Stiles shows how great a part the bedside and the rural public health nurse is destined to play in the attack on hookworm infection in the United States, and how ill-advised is the present policy of economy which has recently handicapped the work of the public health nurse.

The bedside nurse by taking note of anaemia, scanty pilosity, tibial scars, delayed menses and a history of ground itch can get her suspicions set at rest by microscopical faecal examination. The rural public health nurse, with her energy, enthusiasm and faithfulness, has done and is doing most valuable work by enlisting the co-operation of teachers in the detection of suspected pupils on the basis already noted (this *Bulletin*, Vol. 29, p. 418) by means of her own symptomatic examinations, and by persuasion of reluctant parents, so that these suspects may be induced to deliver faeces for that microscopic "selective" examination which Stiles advocates. She can also meet a relatively new obstacle. "In 1927 the Rockefeller Foundation announced that 'hookworm disease has almost disappeared from the United States.' This highly exaggerated statement from such a prominent authority, which has accomplished so much good here and abroad in combating this malady, was broadcast by the lay press, reached a vast audience, and was accepted as authoritative by many people both in educated and uneducated circles. As a matter of fact the claim is

not in harmony with theoretical considerations, and is contradicted by actual clinical observation and by laboratory investigation. The nurse is in a position to help counteract the harm which this claim has done." Stiles is strongly against treatment on a symptomatic diagnosis without faecal microscopic examination, and in the very rare exceptions in which he has broken this rule carbon tetrachloride has not been used, nor should it ever be given unless ascaris is excluded. He is not a believer in "mass" or "herd" treatment. C. L.

PENSO (Giuseppe) Studi sull'anchilostomiasi. I concimi chimici nella profilassi dell'anchilostomiasi nelle campagne (Ricerche sperimentali). [Chemical Manures in Prevention of Ankylostomiasis.]—*Ann d'Igiene*. 1933 May. Vol. 43 No 5 pp. 352-360.

The author tested the effects of addition of chemical substances, many of which are used in agriculture, on hookworm eggs and larvae. The following were employed in his experiments: nitrate of calcium, nitrate of sodium, sulphate of ammonium, sulphate of iron, chloride of potassium, "perphosphate" [? of potassium], calcium cyanamide and a mixture, each in strengths of 1 and 0.1 per cent.

Those bringing about death of the larvae were ferrous sulphate in 5 days in a dilution of 1 per cent., in 7 days if 0.1 per cent was used, and the cyanamide of calcium, which in the greater concentration killed all larvae in 7 days; several survived the higher dilution (1 in 1,000) for 8 days. Nitrate of calcium, 1 per cent., killed the majority in 5 days, but some survived.

The first, therefore (Fe sulphate) proved the most efficient larvicide and it also delayed egg development for 72 hours. Moreover, it has the advantage of acting as a fertilizer for gardens, and is consequently very suitable from the agricultural aspect as well as that of disinfector of human faeces

H. H S

- i. WAKESHIMA (Tadasu). Experimental Studies on the Tropisms of the Mature Larvae of Ancylostomidae. I. Report: Especially on the Thigmotropism of *Ancylostoma caninum*.—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1933 Aug. Vol 32. No 8 (341). [In Japanese pp 1127-1150 With 12 figs [29 refs.] English summary pp. 109-113.]
- ii. —. II. Report: Especially on the Hydrotropism of *Ancylostoma caninum*.—*Ibid.* Sept. No 9 (342). [In Japanese pp. 1274-1290. With 4 figs. [22 refs.] English summary pp. 125-128.]
- iii. —. III. Report: Investigations on the Chemotropisms of the Mature Larvae of *Ancylostoma caninum*.—*Ibid.* Oct. No. 10 (343). [In Japanese pp. 1345-1371. With 6 figs. [37 refs.] English summary pp. 133-136.]

The dates of these publications on taxis of hookworm larvae lie between that of FULLEBORN and LANE (this *Bulletin*, Vol. 30, p. 687) so that Wakeshima was without that clarification of the position which was attempted in those contributions, particularly as to the exact definition of thigmotaxy and its division into positive and negative kinds.

i. From the result of a number of experiments of different sorts it is concluded that infective hookworm larvae exhibit manifest, though weak, thigmotaxy.

ii. Similarly, as the result of a number of equally ingenious tests it is concluded that "hookworm larvae are not, or certainly not under all circumstances, subject to hydrotropism."

iii Various chemical substances were investigated and the results recorded as tested by mature larvae of *A. caninum*.

1. *Tissue extract, bile, blood*.—The method was to mix an equal quantity of these with a 4 per cent. agar solution and solidify; alongside a straight edge of this, 2 per cent. agar was solidified. On this edge were placed petals of the larvae. The number of larvae found on the side with tissue extract, bile or blood was without exception much higher than that found on the other side, whether the added fluid were that of rabbit or dog. If the amount of blood were less than 5 per cent. there was no tropism.

Arterial and venous blood.—In plates similarly prepared there was no evidence of preferential migration in either direction.

Strong chemicals.—When a well was cut in the centre of a 2 per cent. agar plate and filled with hydrochloric or sulphuric acid or caustic soda solution most larvae from a tuft placed peripherally hesitated to enter the impregnated zone. When the well was filled with cresol solution, formalin or 1 per cent. aqueous solution of corrosive sublimate there was no such hesitation. The water of condensation round alcohol or tincture of iodine solution prevented satisfactory results. Lugol's solution killed them so rapidly that no sure taxis was recognisable.

Carbon dioxide and oxygen.—No taxis, positive or negative, was observed.

No relationship between chemotaxis and the retention or shedding of the sheath was detected though the matter was not examined statistically. [There is, then, definite further evidence of penetration of the sheath by nutritive substances—tissue extract and blood plasma and their possible effect on larval longevity cannot in future be summarily rejected]

C. L.

WAKESHIMA (Tadasu) & ABE (Sadaji). **Report on the Mass Treatment of Hookworm Disease, especially on the Effect of Certain Anthelmintics.**—*Taiwan Igakkai Zasshi* (Jl. Med. Assoc. Formosa). 1933 Oct. Vol. 32. No. 10 (343). [In Japanese pp. 1383–1391. [27 refs] English summary pp. 138–139.]

The doses and effects of the drugs employed in the mass treatment of hookworm are seen in the table :—

Relations between the doses of anthelmintics and their effect

Doses of {	Carbon tetra- chloride	3.15 cc	3.0 cc	2.7 cc.	1.87 cc.	1.65 cc	1.25 cc.
Oil of cheno- podium		1.0 cc	1.0 cc	1.0 cc	0.6 cc	0.5 cc	0.5 cc.
Number of persons treated		18	55	23	34	11	21
Number of persons who expelled worms		15 (83%)	49 (89%)	21 (91%)	19 (56%)	6 (55%)	8 (38%)
Number of worms ex- pelled		210	2,004	548	65	72	41
Average number of worms per person		12	36	24	2	7	2

With doses of 2·7 cc. of carbon tetrachloride with 1 cc. of oil of chenopodium, or with larger ones, there were 4 cases of headache, 5 of dizziness and 1 of colic

C. L.

SCUDERI (Giovanni). La velocità di sedimentazione dei globuli rossi nella anchilostomiasi [**Sedimentation Rate of Erythrocytes in Ankylostomiasis.**—*Riv. Sanitaria Siciliana*. 1933. Sept. 1. Vol. 21. No. 17. pp. 1311-1314. English summary (4 lines).

The author's conclusions are these :—

(1) The rate of sedimentation is markedly accelerated in ankylostomiasis. (2) Return to normal rate after specific treatment indicates elimination of the parasite, which is confirmed by faecal examination. (3) If the rate remains the same after treatment as before, we can affirm with certainty that the parasite is still present, and this too is confirmed by faecal examination. (4) A hookworm patient with a normal sedimentation rate may be regarded as definitely cured.

The English summary appended to the paper goes further and states that in ankylostomiasis the sedimentation of red corpuscles is markedly accelerated, a return to a normal rate being directly related to recovery, and that the reaction may have a prognostic and prophylactic use in substitution for, or in confirmation of, the faecal finding. The published basis of the conclusions is 9 cases, 5 being followed up of which 4 were deemed cured and one was proved uncured by faecal examination. It is noted that the change in sedimentation rate is best ascribed to secondary anaemia, since in grave states of this kind this rate is markedly increased. The faecal diagnostic technique is not mentioned. [The inferences implicit are that general conclusions can be drawn from these small numbers, that the particular technique used for the faeces is of so little importance that there is no need to mention it, and that anaemia may be taken as a measure of infection] C. L.

FAUST (Ernest Carroll). **Experimental Studies on Human and Primate Species of Strongyloides. II. The Development of Strongyloides in the Experimental Host.**—*Amer. J. Hyg.* 1933. July. Vol. 18. No. 1. pp 114-132. With 7 figs. [11 refs.]

This important work indicates that the active procreatory stage of this infection—comprising both male and female adult worms—takes place in the air passages.

Following on FULLEBORN's demonstration (1914. Vol. 18. *Beiheft 5, Arch. f. Schiffs- u. Trop.-Hyg.*) that in the course of their journey from skin to bowel some infective larvae remain in the air passages and there grow into adult females, and on KREIS's (this *Bulletin*, Vol. 30, p. 224) that parasitic males may be passed in the faeces, Faust has studied in 40 dogs 12 strongyloides strains—8 from man, 3 from primates and 1 from the dog. He has traced in the lungs, bronchi, and alimentary canal (except the appendix) the development from filariform larvae, through post-filariform larvae, pre-adolescent males and females, adult males and females, to eggs, and rhabditiform and filariform larvae. Migration from lungs to alimentary canal occurs primarily in the adolescent stage, fertilization presumably taking place in the lungs, for there the sexes lie in close proximity. Males were also

found unattached in the intestine and cystic duct, so that fertilization may possibly take place there also, but at least it must do so at some period before the female becomes embedded in the intestinal mucosa, in which males have not been found. It is further suggested that fertilized eggs proceed to direct, and unfertilized eggs to indirect, development, as being consistent with the observation that a strain remaining for any length of time in the host tends to change from an indirect to a direct type, that is as spermatozoa are presumably used up. There should, however, here be noted Faust's important experience, that the individual female does not lay eggs for more than about two months and thereafter is destroyed in the body, a finding which suggests that the explanation of this change may prove to be other than he proposes. It is pointed out that the site of mature males and females in the lungs indicates that in those organs lies a focus for what Faust terms hyperinfection, that is to say for the development of those small filariform infective larvae which need no extracorporeal life to reach that stage, and so, it may be commented, could carry on a long-term infection through successive short-lived forms. C. L.

CADHAM (Fred T.). **Infestation with *Strongyloides stercoralis* associated with Severe Symptoms.**—*Canadian Med. Assoc. J.* 1933. July. Vol. 29. No. 1. pp. 18-19.

An infection with strongyloides in one who had never been outside Canada and for some years not outside the prairie provinces.

A staff nurse in a local hospital suffered from severe diarrhoea, nausea, epigastric distress, urticaria, loss of weight to 40 lbs. and debility. Exhaustive examinations leading nowhere, the stools were examined after a drastic purgative and eggs of strongyloides discovered. "These eggs hatched *in vitro*. At intervals the motile rhabditiform larvae were also noted in the stools. The appearance of abundant larvae in the faeces coincided with the outbreaks of urticaria." Within a month of the administration of thymol she was in normal health and had fully regained her weight. It is pointed out that she may have obtained the infection in the course of her duty. C. L.

SATO (S). Studien ueber die Therapie der Strongyloidosis. [**Treatment of Strongyloidosis.**]—*Fukuoka-Ikwadaigaku-Zasshi (Fukuoka Acta Med.)*. 1933. Sept. Vol. 26. No. 9. [In Japanese pp. 1587-1610. [23 refs.] German summary pp. 89-90.]

Observations on the treatment of strongyloidosis were carried out *in vitro*, on experimental animals, and on man.

In vitro filariform larvae were killed by 10 per cent. yatren in 120 hours, by 1.5 per cent. stibnal in 72 hours and by 7 per cent. fouadin in 96 hours; while as regards nine dyes mercurochrome 220 was the most effective and methyl violet the weakest, the others being trypan-flavin, dahlia, gentian violet, rivanol, crystal violet, flavicid and pyronin. The following were without effect: intramuscular injections of 7 per cent. fouadin in dosage of 0.05 to 0.1 cc. per kilo, oil of chenopodium combined with yatren, and the so-called milk cure of Mense. Rivanol by mouth gave uniform and good results, the dose being unstated in the German abstract. The action of gentian violet in large doses of 0.02

to 0.03 gm. per kilo was very marked but was somewhat dangerous for the infected dogs. Rivanol is advised for the prevention of auto-infection.

C. L.

MATERNOWSKA (Irena). Intradermale Hautreaktion bei Trichinose. [**Intradermal Skin Reactions in Trichinosis.**]*—Zent. f. Bakt.* I. Abt. Orig. 1933. Aug. 15. Vol. 129. No. 3/4. pp. 284-301. With 6 figs.

Intradermal reactions in trichinosis are, it is concluded, specific.

Thus they were positive in 23 men, 14 guineapigs, 44 rabbits and 12 pigs who were infected, and negative in 24, 7, 9 and 1 of the same hosts who were not infected, nor did peptone or salt solutions give positive results in infected cases. Similarly in man and animals infected with ascaris, an ascaris antigen gave positive results but a trichuris antigen did not. In man the immediate reaction, an oedematous wheal appearing within 9 hours, was nearly always followed by a delayed one, reaching its height in 24 to 48 and ending in 40 to 52 hours after the injection, and characterized by a cellular infiltration, with eosinophils, large and small lymphocytes and tissue cells. In guineapigs and rabbits the reaction tends to be only immediate early in the infection, with both phases later; though in rabbits individual differences are great. In pigs there is a direct reaction only, but cellular infiltration begins at once. In early infections there is in general a short immediate reaction only, in those of over 30 days a longer diaphasic one. The latter was first observed 5 days after infection and was obtained up to 400 days, the limit of the tests. Reaction depends on the date of infection, the concentration of antigen, the anatomic quality of the skin and, perhaps, the intensity of infection. It is a very certain diagnostic method for man and animals. C. L.

GORDON (Harold). **Appendiceal Oxyuriasis and Appendicitis based on a Study of 26,051 Appendixes.***—Arch. Pathology.* 1933. Aug. Vol. 16. No. 2. pp 177-194. With 7 figs. [40 refs.]

A study of the relation of *Enterobius vermicularis* to the appendix and to appendicitis

"1. The incidence of appendiceal oxyuriasis is increasing. Oxyurids were found in 311 of 26,051 (1.19 per cent) appendixes removed at operation. In the first 20,969 appendixes in this series, the incidence was 1.04 per cent

"2. Oxyurids occasionally cause minute mucosal lesions in the appendix. These lesions are accompanied by evidence of living tissue reaction, punctate hemorrhages, slight exudation and necrosis. The lesions occurred in 12 instances only, to this condition the term "appendicopathia oxyurica" may properly be applied.

"3. In 256 instances the parasites occurred in the lumen of the appendix without producing visible lesions.

"4. In 33 instances oxyurids were found in the wall of the appendix. Evidence is adduced to show that in this group penetration occurred after operation in every instance. This type of invasion is therefore of no pathologic or clinical significance.

"5. No examples of appendicitis oxyurica occurred in my material.

"6. Oxyuris vermicularis is not a significant cause of appendiceal pathologic changes."

C. L.

ELSBACH (L.) Klinische onderzoeken over filariasis. [**Clinical Observations on Filariasis.**]—*Geneesk Tijdschr. v. Nederl.-Indië*. 1933. May 23. Vol. 73. No 11 pp. 647-658.

The author maintains that the pathological lesions produced by *Filaria bancrofti* are referable to a primary injury of the endothelium of lymph vessels and lymph nodes. The lymph pressure is too low and the anastomoses of lymph vessels too extensive to admit that occlusion of single lymph vessels by adult parasites or inflammation could be their sole explanation.

It is difficult to find adult parasites in these cases and difficult to allow, therefore, that lymphatic obstruction of a whole territory such as the lower extremity can be produced by their blockage. Nor is the blockage a real one, for if an affected leg be raised the swelling markedly diminishes. It is not the lymph vessel or lymph node which is wholly or partially closed by parasites or by inflammation, but the lymph circulation which is otherwise impeded. Filarial manifestations are typically restricted to regions where the lymph stream is in the reverse direction to the action of gravity. Lymph varices do not occur on the face or neck, seldom in the upper extremity and rarely on the abdomen. Clinical evidence, with cases given in support, has convinced the author that the primary symptom of filariasis is an affection of a definite part of the lymphatic system brought about by toxins of the adult filariae, acting on the lymphatic endothelium, predisposing to oedema and dilatation of lymphatic vessels and finally leading to elephantiasis. Microfilariae may be present in great numbers: they are probably non-pathogenic. Where, however, microfilariae are there also will there be adult filariae. If the toxin of the adult parasite passes to the blood stream it is rendered innocuous in the liver, kidneys or bone-marrow and, in any case, it undergoes much greater dilution than in the lymphatic system. It is lymphatic endothelium which is most exposed to its action. An indication of the stimulation of the lymphatic system is given by the absolute lymphocytosis and the appearance of plasma cells in severe cases of filariasis.

Acute filarial attacks have, according to current opinion, nothing to do with a filarial toxin but are secondary to inflammatory infections by low grade cocci. The lymphangitis, which is the essence of these attacks, differs, however, from ordinary lymphangitis, (1) in the frequency of occurrence of a general reaction, with shivering, vomiting, delirium, passage of little or no urine and jaundice, (2) in a comparative absence of localization of the inflammatory process. The lymphangitis is regarded by the author as due to inefficiency of the lymphatic system, with diminution of filter action and of phagocytic activities.

A degree of immunity to clinical filariasis, as regards certain sections of the population in Paramaribo, even with equality of filarial infection, is apparent. Javanese and British Indians escape as also do the inhabitants of the bush lands, whereas young British Indians and Creoles living in the town are the main sufferers. The author ascribes this to a high resisting power on the part of the reticulo-endothelial system brought about by numerous malarial attacks in the former and the absence of this stimulus to the production of immunity of this tissue to filarial toxin in the latter.

His concluding remarks are :—" Filariasis is regarded as a specific affection of lymphatic endothelium due to the toxin of adult parasites, in support of which the arguments are advanced of, (1) the occurrence

of a primary elephantiasis in filarial patients without lymphangitis, (2) the severe general reaction of the acute filarial attack . . . and (3) the immunity to filarial toxin of sufferers from malaria.

W. F. Harvey.

[Proliferation of the endothelial layer about many adult wuchereriae is nowadays a matter of established observation, not one of inference.]

C. L.

O'CONNOR (F. W.) & HULSE (C. R.). *Wuchereria bancrofti* Infection. **Two Case Reports.**—*Lancet* 1933. Aug. 19 pp. 404–406

A further contribution to the study of filarial periodicity.

"Excision of lymphatic glands was performed in two cases diagnosed as filarial, with a view to recovering adult filarial worms. This object was realised. Both operations were performed before midday but close to that time, and it was predicted as the result of previous observations that if living female *W. bancrofti* were present, parturition would not have taken place but would be imminent or just beginning. The prediction proved to be exactly correct in both cases. In the first case, in which the glands were excised at 11.30 a.m., microfilariae were found in the vagina and, in very small numbers, in the lumen of the lymphatic close to the vulva. In the second case, while microfilariae were also found in the vagina, no embryos had reached the exterior of the parent worm before operation.

"In both cases microfilariae apparently healthy, and microfilariae and ova in various stages of degeneration, were found in the afferent radicals and cortical sinuses of lymphatic glands. In a separate group of glands from the second case healthy and degenerating microfilariae but no ova were found in similar situations. . . .

"How ova in addition to microfilariae may reach a lymphatic gland is not clear, but it seems possible that independent of abortion a few ova may pass to the exterior of the worm following the stream of microfilariae through the vagina at the end of parturition. If the parent worm is at some distance from the gland it is conceivable that the nearly developed ova will have completed development in the lumen of the lymphatic and, having stretched the chorionic membrane, be transformed into completely developed microfilariae by the time they reach the gland."

[These cases are in addition to those referred to by LANE in his paper on filarial periodicity (see this *Bulletin*, Vol. 30, p. 703–4).] C. L.

DRINKER (Cecil K.), WISLOCKI (George B.) & FIELD (Madeleine E.). **The Structure of the Sinuses in the Lymph Nodes.**—Reprinted from *Anatomical Record*. 1933. June. Vol. 56. No. 3 pp. 261–273. With 10 figs. on 3 plates.

A by-product of these experiments, the object of which was to determine what cells line these sinuses, was the demonstration of a striking function of theirs, which presumably is of daily importance in filariasis.

Through their quartz canulae the authors injected into the afferent lymphatics of lymph nodes suspensions of Indian ink or acacia-graphite, at pressures proved normal for the young dogs they used. These particles at once adhered to the walls of the lymph node sinuses and to the reticulate fibres which cross them. "This quality of the cells

whereby adhesion of foreign particles takes place almost instantaneously must facilitate prompt and complete phagocytosis of foreign material."

[By the courtesy of Professor Drinker, the reviewer was able to show at the November Meeting of the Royal Society of Tropical Medicine and Hygiene two consecutive popliteal glands from the same dog, the afferent vessel to the lower of which had been injected by Dr Drinker in the manner described above. A comparison of these beautiful specimens showed how very efficient was this spider's web action of the sinuses in retaining particles of Indian ink. By courtesy of Professor F. W. O'CONNOR there was shown, side by side with these, a section by him in which a single microscopic field displayed in a cortical lymph node sinus 14 ova of *W. bancrofti*, 3 still-coiled embryos and one extended microfilaria, and others in which microfilariae entangled in these sinuses appeared to be in process of lysis.] C. L.

KORKE (Vishnu T.). **Observations on Filariasis in Some Areas in British India. Part IX. Sind Area.**—*Indian Jl. Med. Res.* 1933. Oct. Vol. 21. No. 2. pp. 437-440.

Of 500 thick blood films taken between 7 and 9 p.m. from male prisoners in Sind, none showed evidence of filariasis, 446 were permanent residents and 54 came from other parts of India. C. L.

POPESCO (Fr.) L'action thérapeutique de la foudaine sur la filariose canine. [**Therapeutic Action of Fouadin on Filariasis of the Dog.**]—*C. R. Soc. Biol* 1933 Vol. 114. No. 29. pp. 219-220.

Experiments with 14 dogs led to the conclusion that repeated large intravenous injections of fouadin are excellent in the treatment of filariasis of the dog.

The first injection had varied from 2 to 5 cc., the course has varied from 4 to 8 injections over 5 to 14 days, with a total of from 10.5 to 43.5 cc. After the 4th or 5th injection the animal shows fever, distress, loss of appetite, acceleration of pulse and respiration and catarrhal rhinitis with lessening of the number of microfilariae. A sure sign in males that these have disappeared is a double orchitis with ulceration of the scrotum C. L.

RAO (S. Sundar). **Filarial Worms under the Human Conjunctiva.**—*Indian Med. Gaz.* 1933. July. Vol. 68. No 7. pp 394-395. With 1 coloured plate.

Worms were not present in the pieces of conjunctiva excised.

A Calcutta Jewess of 16 had several members of her family infected with *W. bancrofti*. She had swelling of the left foot and ankle and increasing dimness of vision of the left eye.

"On examination, two worms, one on either side of the left cornea, were seen coiled up just under the conjunctiva. The worms were so prominent that they were visible from a distance. The patient was admitted into the Carmichael Hospital for Tropical Diseases on the same day. One worm was seized with forceps and held during removal of the portion of conjunctiva containing it, by Lieutenant-Colonel Kirwan, I.M.S. As the first worm was being removed, the one lying near the inner canthus disappeared temporarily and reappeared in the original site after 3 days, when it was excised. Neither of the worms could be found

although the whole of the portions of conjunctiva removed were sectioned, mounted serially and examined. The patient has been under observation for more than three months since the above operation and the worms have not appeared again in the eye "

Microfilariae never found ; eosinophils 6 per cent.

C. L.

HSU-HSI-FAN. On *Thelazia callipaeda* Railliet and Henry, 1910, Infection in Man and Dog.—*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. Aug. Vol 37. No 8. pp. 363-369 With 3 figs. [16 refs.]

A fourth case of human infection with *Thelazia callipaeda*, at Chang-sintien, Wanpinghsien, is reported in a boy of 10 from whose conjunctival sac 5 male and 16 female worms were removed.

Examination of this material, of that reported by FAUST (this *Bulletin*, Vol. 24, p 532), and of worms from dogs in Peiping, leads to the conclusion that all are specifically identical. For the first time detailed measurements are published, the worms from man running rather smaller than those from the dog. The author's findings do not agree with those of FAUST as to the shape of the oral capsule, the circumoral papillae whether from the new or from FAUST's material, and the caudal papillae of the male. He supports his contention by clear drawings.

C. L.

HISSETTE (J.). Analogies cliniques entre les onchocercoses américaine et africaine [Clinical Analogies between the American and African Forms of Onchocerciasis].—*Bull. Méd. du Katanga* 1933. Vol. 10. No. 3 pp. 61-3, 65-7, 69-73, 75-7, 79-81, 83.

This paper reinforces the author's conclusions (this *Bulletin*, Vol. 30, p. 709). After a long historic section there follows one on the resemblances between American and African onchocerciasis, in which it is emphasized that the absence or rarity of elephantiasis as a manifestation of the American form, where localization occurs high in the body, is no argument against its causation by this parasite in Africa. Stress is laid on the need for rigorous and detailed autopsies to throw light on controversial points.

C. L.

GOYANES ALVAREZ (José). El "granuloma filariósico" por *Onchocerca volvulus*. [Filarial Granuloma due to *Onchocerca volvulus*.]—*Trabajos*. Madrid. 1933 June 15. Vol. 2. No. 15. pp. 41-42

The author describes the detailed tissue changes set up by the presence of *Onchocerca*. He notes the endothelial proliferation resulting in marked fibrosis and the formation of giant cells, swelling of vascular endothelium, lymphocytic reaction and eosinophilia. The author acknowledges that his description tallies with that of A. S. MOHAMMED (this *Bulletin*, Vol. 29, p. 85) but an even fuller account is that of I. OCHOTERENA [*loc. cit.*].

H. H. S.

THOMPSON (W. E.). Strangulated Hernia in Association with Dracontiasis and Hydrocele. [Memoranda.]—*Brit. Med. Jl.* 1933. Sept. 16. p. 528.

Thompson publishes this case from the Nizam's Dominions, India, as illustrating the precipitation of an acute abdominal crisis by a tropical complaint which, in itself, is rarely dangerous.

A reducible right inguinal hernia of 9 year's duration had threatened strangulation a year earlier and had now produced complete intestinal obstruction for 48 hours. On cutting through the inflamed and oedematous spermatic fascia a guineaworm was found and dissected out from close relation to the proximal end of the inguinal canal. The worm was 52 cm. long and there was a hydrocele on that side, but not on the other. The author speculates whether the larval worm passes into the small intestine before leaving the lumen of the alimentary canal, and whether the presence of a hydrocele acted as an attraction to the female worm with its embryo-filled uterus C. L.

CUSSET (Jean) & GOLDENFOUN (Z.). Etude d'une tumeur du testicule chez un indigène atteint d'éléphantiasis. Essai sur la pathogénie de cette affection. [**Testicular Tumour in Native with Elephantiasis.**—*Bull. Soc. Path. Exot.* 1933 Oct. 11. Vol 26. No. 8. pp. 1106-1109.]

On an examination of this Senegalese case the hypothesis is put forward that the oedema of those with elephantiasis is due to lymphangitis combined with a peripheral neuritis.

As to the microscopic characters of the mass, which comprised scrotum, hydrocele and testis and hung down to the knees, there seems to be a sharp difference of opinion. The authors describe it as an invasion by fibrous tissue and cartilage which encloses masses of Wolffian cells, in fact, a fibro-cartilagenous "dysembryome" with scattered cysts containing red corpuscles, the neoplastic tissue taking the place of the noble testicular elements with disappearance of the seminal tubes. CORNIL of Marseilles, after examining a portion, designates it as inflammatory tissue with (1) nodules where this reaction is manifest with lymphocytes, plasmocytes, red corpuscles and histiocytes often containing yellow pigment, (2) local fibroblastic, collagenous and hyalin change, (3) an intense angiomatous reaction with haemorrhages. Under diagnosis are mentioned the changes studied by PETIT and BAHR, the lymph vascular lesions reported by NATTAN-LARRIER and LAIGRET, and the fact that this and another case come from an area of elephantiasis. There is mention that NATTAN-LARRIER has reported several cases of cancer of the thoracic duct ("canal thoracique") secondary to filarial lymphangitis, and, relating to the controversy as to whether elephantiasis is of filarial or bacterial origin, the point is made that at first the skin is healthy.

[Examination of NATTAN LARRIER's paper discloses mention of thrombosis of the thoracic duct. No mention of cancer was traced.]

C. L.

CRUZ (Walter Oswaldo). Présence d'hémolysines dans les extraits de parasites intestinaux du chien (*Ancylostoma caninum* et *Toxocara canis*). [**Haemolysins in Extracts of Intestinal Parasites of the Dog.**—*C. R. Soc. Biol.* 1933. Vol. 114. No. 29. pp. 139-141.]

There is found in these worms a haemolytic and heat resistant substance, but to give clear haemolysis the extract must be very concentrated and must act for a relatively long period.

Since there is but little of any haemolytic substance present and since it is non-specific, it is concluded that it is not an effective factor in the production of anaemia.

C. L.

ALEXEIEFF (A) Sur les facteurs déterminant le développement des oeufs d'ankylostomes—*Bull Soc Path Exot* 1933 July 12 Vol 26 No 7. pp 930-934.

HARLEY (G. W) Microfilariae and Insect-Saliva. [Correspondence]—*Trans Roy. Soc Trop Med & Hyg* 1933. June 29. Vol 27 No 1 pp 109-110.

SATO (S) Immunologische Studien ueber die Strongyloides-Infektion—*Fukuoka-Ikwadagaku-Zasshi (Fukuoka Acta Med)* 1933 Sept Vol 26 No 9 [In Japanese pp 1526-1586 With 17 figs (4 coloured) on 4 plates [61 refs] German summary pp 88-89.]

HSTÜ (H F.) On *Dracunculus houdemeri* n sp, *Dracunculus globocephalus*, and *Dracunculus medinensis*—*Ztschr. f. Parasitenk.* 1933. Sept. 6 Vol. 6. No 1 pp 101-118 With 38 text figs [10 refs]

SPRUE.

ADAMS (A. R. D.) **Sprue in Mauritius.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. July 28. Vol. 27. No. 2. pp. 199–200.

The author refers to the case of an Englishman invalided from Mauritius in 1930 suffering from a disease diagnosed in London as sprue. This patient returned to the island in good health after treatment. The case here reported in detail is, however, put on record as the first instance within the author's knowledge of a Mauritian being attacked, as there is a general belief that sprue does not occur in Mauritius.

The patient was a powerfully built man of 35 years who stated that his normal weight was 120 kgm. or over. He had suffered for 4½ years with dyspeptic symptoms and diarrhoea (two to ten stools daily), particularly in the early morning, the motions being bulky, pale, frothy and offensive. In the last 18 months he had lost 40 kgm in weight and he appeared ill, pale and emaciated and complained much of flatulence. Temperature was normal, there was no jaundice and the tongue and mouth were not affected. The blood count gave 3,800,000 red cells and 8,500 white per cmm; there was some poikilocytosis and two megaloblasts were seen in the stained film [The size of the corpuscles is not stated.] Plasma calcium 7·8 mgm. per cent. There were no helminth ova seen in the faeces, analysis of dried faeces showed total unsaponified fats 30·6 per cent, free fatty acids 15·62, neutral fats 4·22 per cent. The van den Bergh test gave a delayed direct and very weak indirect reaction.

He was put on a milk diet and was given calcium and hydrochloric acid by mouth, in two months he gained 12 kgm. in weight. The diarrhoea ceased in a fortnight. The patient returned to work and for the past two months has kept well, but finds that he has to avoid certain articles of diet. There was no indication of pancreatic affection nor of any condition other than sprue to account for the steatorrhoea, a diagnosis borne out by the other symptoms present. *H. H. S.*

PICARD (René). Un cas de sprue avec syndrome neuroanémique. [**Sprue with Anaemia and Nervous Symptoms.**]—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1933. Feb. 6. 49th Year. 3rd Ser. No. 3. pp. 89–93

An interesting case is described in detail of a man of 48 years (but looking 60), much emaciated and anaemic, with protruberant abdomen and oedema of the legs. He gave a history of "dyspepsia" for 2½ years, with occasional vomiting, 7–8 whitish or yellowish stools a day, but never any obvious mucus or blood. He felt burning in the tongue and mouth and occasionally further along the alimentary canal.

In January 1931, the number of stools increased to 30–40 daily (but never dysenteric) and his state became so alarming that his brother, who was a medical man, brought him from Algiers to Châtel-Guyon. A few days later, *though he had no treatment*, the stools became normal for the first time in over 2 years. He returned to Algiers and his symptoms recurred, 7–10 pale stools daily. In October he developed nervous symptoms, diagnosed as polyneuritic. The neck muscles were first attacked, the head flexed, chin on sternum; he could not extend the head but lateral movements were preserved; a week later first one arm, then both became paralysed. This cleared in a fortnight and paraplegia with pain ensued, but never any sphincter trouble. This lasted for a month; there was no rise of temperature.

The following is a brief account of the results of examination of the blood. In January, 1932, red cells 1,000,000, white cells 6,200, slight relative lymphocytosis, 32 per cent, Hb. 20 per cent., C.I. 2, and marked anisocytosis but no erythroblasts seen. He was given fresh vegetables, fruit *ad libitum* (he had a robust appetite), and calf's liver extract by mouth and intramuscularly. Thirteen days later red cells 2,200,000, Hb 65 per cent, C.I. 1.5. On February 10th corpuscles 2,820,000, only one stool a day and that normal, on 3rd May he said he felt well, red cells were 4,900,000. His weight which on 14th January was 48 kgm. had increased to 72.3 kgm, and he returned to Algiers and has remained well up to the time of the report (January 1933). Faecal examination had afforded but little information. Monilia was not found. The remainder of the paper considers briefly the question of pernicious anaemia and sprue and the nervous symptoms associated at times with the former and the author poses the question as to the unity of sprue and Addison's anaemia or whether this is a case of atypical sprue with nerve lesions but does not attempt a solution. [The spontaneous return to normal stools without any treatment at a time when symptoms were acute is a fact to be borne in mind in interpreting results following some particular form of treatment.]

H. H. S.

COSTEDOAT. Le traitement de la sprue par le foie de veau. [**Calf's Liver in Sprue.**].—*Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1933. Feb 13. 49th Year. 3rd Ser. No 4 pp. 171-173.

The author refers to ROGERS and COOKE's article on the benefit following intravenous administration of a liver extract in sprue [they used Hepatex P.A.F. (see this *Bulletin*, Vol. 29, p 465)] and gives details of a man of 35 years, who for two years presented symptoms of sprue—stools 2-10 daily, fatty and pasty, loss of weight, 8 kgm in two weeks, 30 kgm. in three months, red, sore and tender tongue (but no aphthae), and anaemia, red cells 1,382,000, white 4,200 per cmm. Blood transfusion on two occasions produced little if any amelioration; emetine, stovarsol, yatren were unavailing. With a view to benefiting the anemia, calf's liver, 200 gm. uncooked, was given daily. Not only was the effect on the blood wonderfully rapid—in five days red cells were 2,980,000 and white 6,000, and a fortnight later 4,900,000 and 7,000 respectively but the other symptoms also cleared up and the patient left hospital "cured" 26 days after this treatment was initiated and 7 months later was still in good health.

[In remarking on this case the author states that "the liver extract first used had produced practically no result," but in the detailed account no mention is made of this, what preparation was used, the dosage or mode of administration. The future history of this patient would be of interest; seven months' freedom from symptoms is not synonymous with cure.]

H. H. S.

JEPSON (F. P.). **Dry-Wood-Inhabiting Termites as a Possible Factor in the Etiology of Sprue.**—*Ceylon Jl. Sci.* (Sect. D. Med. Sci.). 1933. Feb. 1. Vol. 3. Pt. 1. pp. 3-46. With 16 plates (1 map). [5 pages of refs.]

This article is the elaboration of a suggestion put forward as a contribution to solving the obscure question of the aetiology of sprue. Since there is a fairly widespread belief, particularly in Ceylon, that

prolonged residence in a "dry-rot bungalow" predisposes to sprue, any evidence, for or against, must be welcome.

The author has made a serious study of this aspect of the subject, pointing out, first, that the usual interpretation of dry rot as fungal growth is not implied in this instance, but as the invasion of the constructing timbers by termites, and he suggests that the ingestion of the faecal pellets of these insects may play an important rôle.

In an outline map are shown, by means of a good graphic device, the places (or countries) where sprue occurs and where dry-wood-nesting termites are common, and the symbols employed demonstrate at a glance where the two coexist. The author is an entomologist and his medical facts and sprue records are largely taken from the literature.

The article, which is beautifully illustrated, savours somewhat of special pleading. In certain countries sprue is endemic but the presence of these termites, *Cryptotermes* and *Planocryptotermes*, has not been recorded. The author explains this by saying that absence of record is not the same thing as absence of termite and quotes, for example, the Philippines where they were not found till sought for, although "almost every house in the Islands is infested by these termites". The reverse of this is less easily explained. Thus, the termites are common in Jamaica but the reviewer in nine years' service there, visiting every inhabited part of the island, did not see a single indigenous case, in fact the only sprue patient was one seen in consultation who was staying for a few days in the course of an ocean tour. Again, the termites are present in Africa, both East and West, nevertheless sprue is so rare in the African colonies that the majority of practitioners deny that it exists. Thirdly, the native wood huts harbour termites quite as frequently as do the bungalows of the Europeans, but, though a few cases have been recorded, somewhat as medical curiosities, in India, [see this *Bulletin*, Vol. 29, pp. 3 and 7] elsewhere natives are not known to suffer from sprue.

The author adduces in favour of his theory the fact that the disease attacks members of a family living in the same house, so does enteric fever, smallpox and other infections, or, a more chronic example, leprosy. Finally, the termite theory does not seem adequate to account for cases developing years (ten and more) after the individual has left the tropics, without having shown signs previously. If any one theory is to explain the aetiology of sprue, it must meet all these facts.

H. H. S.

MILLER (D. K.) & RHOADS (C. P.). **Production in Dogs of a Syndrome Similar to Sprue by Diets Deficient in Vitamin B₂.**—*Proc. Soc. Experim. Biol. & Med.* 1933. Jan. Vol. 30. No. 4. pp. 540-541.

In the anemia of sprue treatment with vitamin B has been followed by rise in reticulocytes and improvement in the blood condition, and in other patients relief of glossitis and diarrhoea. To test what part lack of this vitamin might play in the aetiology of sprue, the authors fed 50 dogs on a diet low in protein, high in fat and carbohydrate and the only vitamin B that present in rice polishings, in fact a modification of GOLDBERGER's "black tongue producing" diet. The animals were not restricted as to the amount they took.

Stomatitis developed in a mild degree in all, the buccal mucosa was injected and presented circumscribed yellowish aphthae; glossitis

was marked, the tongue becoming smooth and reddish with atrophy of papillae. At this stage many refused food, in part or entirely, vomiting was common and diarrhoea marked, the stools usually yellow, voluminous and semisolid, sometimes watery. Loss of weight occurred, about 24 per cent. of that at the beginning of the experiment, blood changes were definite in 30 and marked in 15 of the animals, the red corpuscles falling more than 50 per cent. from 6.4 to 3.1 million and the Hb. value by 30 per cent. (Sahl) At the height of the anaemia the bone marrow, normally fatty and fairly acellular in the dog, became replaced by solid, deep purple-red tissue, like that of cases of pernicious anaemia. Histologically, there was proliferation of endothelial cells and megaloblasts, but little tendency to maturation, very similar to the picture in sprue anemia.

H. H. S.

SCHOTTMÜLLER Die Behandlung der Sprue mit Leber und Eisen — *Deut Med Woch* 1932 Aug 26 Vol 58 No 35. pp 1356-1357 With 2 figs

REVIEWS AND NOTICES.

MORSON (Clifford) [O.B.E., F.R.C.S. (Eng.), etc.]. **Urinary Infections.**—76 pp. Pocket-Monographs on Practical Medicine. 1933. London: John Bale, Sons & Danielsson, Ltd., 83-91 Great Titchfield Street, W.1 [2s. 6d.]

Beginning with a brief introduction on the pathological aspects of urinary infection the author describes acute and chronic colon bacilluria, urinary tuberculosis, genital tuberculosis of the male (presumably genital tuberculosis in the female is considered to be a gynaecological subject outside the scope of this monograph), infection in relation to renal calculus and urinary infections of childhood. There are also chapters on post-operative infections and renal function in relation to infection. The author states that the most important and by far the most common cause of infection of the urinary tract is the colon bacillus and the two chapters dealing with infection by this organism adequately cover the ground in so far as this can be done in a short monograph. The various urinary antiseptics are dealt with, though Mr. Morson considers that the only drug which really fulfils the function of a lethal weapon against infection of the kidney is hexamine. With regard to intravenous therapy in acute colon bacilluria, which is regarded primarily as a bacillaemia, the author concludes after examining the claims of the well-known antiseptics that injection of 100 cc. of a 20 per cent. solution of sodium chloride as recommended by FLEMING is the safest and the best. In the short chapter on chronic colon bacilluria the new ketogenic diet is described and a specimen dietary is given.

The chapter on urinary tuberculosis is a good detailed account of the disease. Mr. Morson emphasizes the importance of a full examination of the whole urinary tract. He also advocates a control examination of the chest with radiogram, for the presence of undetected lesions of pulmonary tuberculosis and infected mediastinal glands. The absolute necessity of a meticulous examination for the presence of tubercle bacilli in the centrifuged deposit of a twenty-four hours' specimen of urine is stressed. In the chapter on tuberculosis of the male genital tract not only are surgical measures dealt with but the medical aspect is considered at some length. The author's experience of tuberculin therapy over a period of 20 years has led "to nothing but disappointment," and he wisely sums up the medical aspect of the disease by emphasizing the importance of a prolonged stay in a sanatorium.

Coccal infections (staphylo- and streptococcal) of the urinary tract and their relation to renal disease and perinephritic abscess are dealt with briefly but the monograph contains little information about the gonococcus.

In discussing renal deficiency tests Mr. Morson rightly prefers the two well-known urine tests of blood urea and urea concentration, and when considering these in relation to prostatectomy he has no hesitation in recommending the operation when the blood urea is as high as 50 mgm per 100 cc. provided there is absence of kidney infection.

There is a helpful preliminary discussion on predisposition and causation in the chapter on stone in the urinary tract in which dietetic factors, etc., are dealt with.

There are one or two slips in the monograph, the most serious of which is the use of bismuth antimony tartrate instead of sodium antimony tartrate for intravenous injection in bilharziasis as introduced

by CHRISTOPHERSON A short list of larger textbooks for reference would be a helpful addition

The book is a practical common-sense presentation of a subject which is all important to the general practitioner.

S. Roodhouse Gloyne.

BIBLIOGRAPHY OF HELMINTHOLOGY FOR THE YEAR 1931. (Compiled by A. WALTON from Titles selected by R. T. LEIPER.)—81 pp. 1932 Dec St Albans Imperial Bureau of Agricultural Parasitology. [Price 6s]

INDEX VETERINARIUS 1933. Apr Vol 1 No 1 pp. xxvi+304. Weybridge Imperial Bureau of Animal Health [Annual subscription £4.]

Early in 1932 the Imperial Bureau of Agricultural Parasitology, one of the Imperial Agricultural Bureaux, began the issue of an annual bibliography of helminthological titles. The first issue published in March 1932, with its Supplement dated February 1933, dealt with helminthological literature appearing in the year 1930, and gave some 1,090 titles collected from 410 periodicals. The "Bibliography of Helminthology for the Year 1931," here noticed, was published in December 1932 and contains some 1,290 titles gathered from 425 periodicals. Titles of individual papers are grouped under the names of the journals in which they appeared, thus departing from the more usual dictionary plan of entry under author and subject. This arrangement is followed also in the *Helminthological Abstracts* issued by the Institute of Agricultural Parasitology, to which the Bureau is attached. It enables one to see clearly what papers of helminthological interest are to be found in particular periodicals, but users who want to know what papers have appeared on a particular subject rather than in a particular journal would probably prefer an arrangement by subjects. An authors' index is given at the end of the bibliography; the more necessary subject-index to titles is published separately and at a later date, and is advertised as being "free on application." The titles noted—drawn from zoological, medical, veterinary, agricultural, and horticultural periodicals throughout the world—are of papers containing helminthological data concerning distribution, systematics, life histories, biology, pathogenesis, therapeutics—especially the growing subject of chemotherapy from the anthelmintic standpoint and in relation to toxicology—and prophylaxis. These annual bibliographies are well printed and carefully edited, and provide permanent, if somewhat belated, records of the literature of helminthology year by year, which should be of great service in all institutes where medical, veterinary, or agricultural research work on parasitology is pursued.

Quite recently the Imperial Bureau of Animal Health, also a body founded under the scheme for Imperial Agricultural Bureaux, has begun the issue, under the title *Index Veterinarius*, of a bibliography of publications relating to veterinary research, administration, public health and education. The first number, dated April and issued in November 1933, covers indexing done at the Imperial Bureau of Animal Health during the first quarter of the year 1933. Subsequent issues, to be published at three monthly intervals, will cover titles indexed at the Bureau in the corresponding previous quarters, thus providing an early source of information of titles of papers of veterinary interest

appearing in current publications. The references in the *Index Veterinarius* are to original articles, reports, books, theses, etc., given under both author and subject in one alphabet on true dictionary lines. Author entries give the full titles of papers in the language of the original, subject entries give brief translations of foreign, and shortened versions of English titles. Numerous cross-references help to make the work self-indexing. The text is reproduced in typewritten characters by the Gestetner duplicating method in double column on one side of the paper only. To get the best results by this process a thick absorbent paper has been used with the result that the first issue, covering only one-quarter of a year's output, weighs 3 lb. and measures over one-and-a-half inches thick. For a bibliographical work that may have to stand up to generations of users such bulk and weight are serious drawbacks. Within the limitations imposed by this method of production, however, the work is well displayed, and is a striking testimony to the amount of veterinary literature indexed at the Imperial Bureau of Animal Health.

But the question arises whether by concentrating within a single Bureau the whole task of preparing an *Index Veterinarius* the opportunity for useful co-operation has not been missed. Bibliographical work, more even than abstracting work, lends itself to collaboration, and with several Imperial Agricultural Bureaux dealing intensively with certain branches of veterinary science such as parasitology, animal nutrition, animal genetics and veterinary entomology, consideration might perhaps be given to the possibility of their co-operation with the Bureau of Animal Health in the preparation of future issues of the *Index Veterinarius*. A comparison of the journals watched by the various Bureaux shows that though certain journals are seen by all, each has on its list an appreciable number with occasional veterinary papers that are not duplicated on the other lists. Co-operation, perhaps on the lines of making each specialist Bureau responsible for the section of the *Index Veterinarius* that concerns it most, would mean a much more complete record, and might at the same time lead to a clearer definition of the respective fields of work of the various Bureaux and thus to the avoidance of what appears to be unnecessary duplication.

R. L. S.

BIOLOGIE MÉDICALE. Supplement. 1933. Dec. 31st Year. Vol. 23. 124 pp.—**Bibliographie du stovarsol 1921-1933.** [Bibliography of Stovarsol 1921-33.]

The preface to this brochure states that it gives the references to more than a thousand publications on stovarsol. These are arranged in two divisions, the first classified according to the therapeutic application and by the alphabetical letter of the author's name, the second in chronological order by years, the latter is the more complete. The headings of the first division give an idea of the uses of this drug—protozoal infections of the digestive tract; protozoa, of blood, bronchi and skin, yaws; syphilis; tuberculosis, helminthiasis. Stovarsol is of value in spirochaetal diseases, in amoebiasis, in giardiasis, in balantidiasis and in malaria in association with quinine. It is noted as curious that whereas orsamine, an isomer of stovarsol, is a good trypanocide, stovarsol itself is ineffective. A. G. B.

TROPICAL DISEASES

BULLETIN.

Vol 31]

1934

[No 3

RABIES.

A REVIEW OF RECENT ARTICLES. XX *

1. *Virus.*

The generalization of LEVADITI that the viruses of poliomyelitis, encephalitis, herpes, rabies and, up to a certain point, the vaccine of Jenner, form a special group which exhibit an affinity for the cellular elements derived from the ectoderm, is well known (LEVADITI, *Ectodermoses neurotropes*, Paris 1922, Masson). LEVADITI and SCHOEN¹ examine whether evidence of the presence of the virus of rabies is to be found in ectodermic structures other than nervous tissues. They have now demonstrated the presence of oxyphil formations resembling Negri bodies in the corneal epithelium, and in the Gasserian ganglion. These bodies were very abundant, and in the Gasserian ganglion were accompanied by neuronophagy. Their presence is, however, not constant.

In a very detailed paper NICOLAU, MATHIS and CONSTANTINESCO² discuss the characteristics of a strain of virus of *Oulou-fato*. They claim that it is less virulent, and more difficult to fix, than is the true rabies virus. The Negri bodies which the *Oulou-fato* virus gives rise to, differ from those of the classic rabies virus in staining blue with Mann's stain, and they are more pleomorphic. On the other hand there is a perfect cross-immunity between the classic and the *Oulou-fato* viruses.

REMLINGER³ summarizes the results of his investigations during recent years on rabies in East and West Africa. He believes that the reported difficulties of fixation of African strains of virus are due to technical errors, and says that "*Oulou-fato* is an obsolete term which ought to disappear from the nomenclature."

* For the nineteenth of this series see Vol 30, p 575.

¹ LEVADITI (C) & SCHOEN (R) Présence de formations oxyphiles ressemblant aux corps de Negri, dans l'épithélium cornéen des lapins rabiques.—*C R Soc Biol.* 1933. Vol 114. No 31 pp. 501-504. With 2 figs.

² NICOLAU (S.), MATHIS (C.) & CONSTANTINESCO (Val). La rage antochtone (maladie du chien fou) en Afrique occidentale française (étude critique et expérimentale).—*Ann. Inst. Pasteur.* 1933. June Vol 50. No. 6 pp. 778-839. With 26 text figs. & 16 coloured figs on 1 double plate [Refs. in footnotes.]

³ REMLINGER (P) Sur le comportement du virus rabique en A.O.F. et en A.E.F.—*Bull. Soc. Path. Exot* 1933. July 12 Vol. 26 No 7. pp. 941-946.

PLANTUREUX⁴ has examined the behaviour of mixtures of fixed and street virus. He finds that the Algerian strain of fixed virus (1,797th passage) when mixed with street virus retains the incubation period of the fixed virus strain, but has the infective power of street virus, when tested by intraocular inoculation. When the Tangerian strain of fixed virus, which is in approximately its 2,400th passage, is employed, the result is entirely different—when inoculated intracranially the mixture behaves like fixed virus, and when inoculated into the eye it behaves as street virus. Later experiments with mixtures containing the Algerian strain of fixed virus (then in its 1,872nd passage) yielded results which approximated more closely to those obtained with the Tangerian strain. Until the behaviour of such mixtures is more precisely defined, it seems needless to consider the suggestion of the author that certain accidents following the exhibition of fixed virus may be due to the action of mixed strains.

REMLINGER and BAILLY contribute a series of papers on the pseudorabies of AUJESZKY. In the first⁵ they state that the virus of the pseudorabies confers rabies when 0.5 cc. is injected subdurally into the rabbit, in dilutions of 1 in 500,000 (*cf.* the virus of herpes 1 in 10,000, the fixed virus of Tangiers 1 in 300,000, to 1 in 500,000). Also that the behaviour of the virus when submitted to the action of heat, and of sulphuric ether is sensibly the same as that of the virus of rabies. On the contrary the former is much more resistant to desiccation than the latter. In a second communication⁶ they show that the pseudorabies virus has the same properties of diffusibility as have the viruses of rabies and of herpes. In a third paper⁷ they advocate the intraocular route in experimental infections because when the fatal issue is sudden, as is usually the case in pseudorabies, there is no difficulty in being certain of the cause of death. Excoriations of the eye were almost always to be seen, and pruritus was present in 48 out of 57 cases. Thus the diagnosis is "sure and precise." The condition of the eye throughout the course of the disease is described in detail. In a fourth communication⁸ they show that the virus of pseudorabies is extremely resistant to desiccation. The virus when emulsified and spread on a thin sheet on glass, did not lose infectivity in 20 days.

Further studies in pseudorabies are presented by HURST.⁹ The histology of the brain in the rabbit, the guineapig, the monkey, the

⁴ PLANTUREUX (E.). Recherches sur le pouvoir pathogène des mélanges de virus rabiques fixes et de virus des rues. Variabilité des propriétés des virus fixes—*C. R. Soc. Biol.* 1933. Vol 113 No. 26 pp. 1141-1143

⁵ REMLINGER (P.) & BAILLY (J.). Action de la dilution, de la chaleur et de l'éther sulfurique sur le virus de la maladie d'Aujeszky—*C. R. Soc Biol* 1933. Vol 113 No 23 pp 689-691

⁶ REMLINGER (P.) & BAILLY (J.) Diffusibilité du virus de la maladie d'Aujeszky.—*C. R. Soc Biol.* 1933 Vol. 113. No 24 pp 844-846

⁷ REMLINGER (P.) & BAILLY (J.) L'inoculation du virus de la maladie d'Aujeszky dans la chambre antérieure de l'œil—*C. R. Soc Biol.* 1933. Vol. 113 No 25. pp 1020-1023

⁸ REMLINGER (P.) & BAILLY (J.). Sur la résistance du virus de la maladie d'Aujeszky à la dessiccation—*C. R. Soc Biol.* 1933. Vol 113. No 26. pp. 1109-1110.

⁹ HURST (E. Weston). Studies on Pseudorabies (Infectious Bulbar Paralysis, Mad Itch). I Histology of the Diseases, with a Note on the Symptomatology—*Jl Experim Med.* 1933 Oct 1 Vol. 58 No 4. pp 415-433. With 3 plates [12 refs]

cow and the pig is described in detail. Peripheral infection is transmitted, along the nerves, possibly interstitially and by the axis cylinders. On reaching the ganglia and segments of the cord, it produces primary degeneration of nerve and glia cells. The nerve cell changes are probably responsible for the cardinal symptom of itching. Death ensues soon after the virus reaches the medulla, before visible changes have been produced. In these experiments both the Aujeszky and Iowa strains were employed.

ii Symptomatology.

After describing the histories of three cases of human rabies, MATILLA¹⁰ discusses, in a general way, some of the more interesting features of the disease.

iii Pathology.

HAVENS and MAYFIELD¹¹ present additional evidence in favour of the view that different strains of rabies virus possess the same antigenic factors but in varying proportions (see also this *Bulletin*, Vol. 30, p. 580). The results have been obtained from neutralization of virus with heterologous serum and from agglutinin absorption tests. The differences observed were quantitative rather than qualitative. From similar experiments with 3 strains of fixed virus they find that continuous passage through the rabbit results in antigenic loss, and in a pronounced change in antigenic structure.

JONNESCO¹² has conducted a series of experiments to elucidate the question whether an immunized animal which escapes infection from a subsequent subdural dose, is refractory to further subdural inoculation. Three dogs were immunized against rabies by carbolized vaccines, and were then tested subdurally with fixed virus. One died, and the other two survived. A second inoculation with fixed virus killed one of the survivors and failed to kill the other. The remaining dog having resisted three successive subdural tests, succumbed to the fourth. The brain of this last dog was not pathogenic to dogs and rabbits, but produced rabies in guineapigs and mice without modification of incubation period.

The results of experiments to determine whether rabies virus is present in the cerebrospinal fluid have so far been irregular. KERBLER¹³ has further investigated the point. He found that fluid taken from sheep during the extraction of the brain and the cutting out of the cord in every instance proved infective when inoculated into experimental animals. On the contrary when fluid was carefully drawn by occipital puncture of the subarachnoid space of sheep in the last stage of rabies, it was never infective. The latter experiment was fully controlled, and was carried out on 12 sheep. The quantity of virus

¹⁰ MATILLA (V.) A propósito de algunos casos de rabia humana —*Rev. San. e Hig. Pública* 1933 Aug Vol. 8 No. 8 pp. 166-175. [14 refs.]

¹¹ HAVENS (Leon C.) & MAYFIELD (Catherine R.) Antigenic Properties of Rabies Virus. III. Composition of Serologic Variants and Nature of Fixed Virus.—*Jl. Infect. Dis* 1933. May-June Vol. 52. No. 3. pp. 364-373

¹² JONNESCO (Demètre) Le sort du virus rabique fixe dans le cerveau des chiens immunisés.—*C. R. Soc. Biol.* 1933. Vol 113. No. 27 pp 1249-1251.

¹³ KERBLER (Ferdinand). Ueber den Nachweis von Lyssavirus in der Cerebrospinalflüssigkeit —*Ztschr. f. Hyg u. Infektionskr.* 1933. June 15. Vol. 115. No. 2. pp. 235-240

present must have been less than 0.0002 mgm. per 0.2 cc. He also found that the fluids had no rabicidal action. He believes that the irregularity of previous observations depended upon differences of technique

iv. *Methods of Treatment and Statistics.*

A comparative study of the relative efficacies of various methods of treatment assessed from experiments on rabbits is reported by OKUWADA.¹⁴ The tests were carried out on a large scale and were well controlled. The batches both of treated and untreated were of the order of 15 animals. In all 4,000 rabbits were used. The test doses were 0.1 cc. of the supernatant fluid of a fresh emulsion of fixed virus, diluted in various proportions and injected subdurally. The methods investigated were (1) dried cords, (2) dilutions, (3) heating, (4) freezing, (5) carbolic acid (incubated for 48 hours at 37°C.), (6) ether, (7) glycerin, (8) formalin, (9) gastric juice, and (10) artificial gastric juice. The experiments are set out in 8 tables, and the system followed was to compare selected pairs of methods of treatment with a control set. The results of each set are expressed as the minimum infective dose (e.g., Pasteur treatment: 14 animals, minimum infective dose 1 in 50,000 = 0.1 c.c. (+), which means that a dose of 0.1 c.c. of a 1 in 50,000 dilution of the supernatant fluid of a freshly prepared emulsion of fixed virus was the lowest dose which brought about successful infection). [It would have been more convincing if the author had employed some method of recording his results which would have given information as to the regularity of the readings from which his minimum infective doses are obtained. The reviewer would suggest that the results of this huge experiment, involving enormous labour, are worthy of a much fuller presentation than he has given us. At the present the reviewer can do no more than quote the conclusions.] He finds (1) that large doses of killed virus are preferable to lesser doses of live virus as they achieve an equally high degree of immunity without incurring other risks; (2) that yatren or ether are better than carbolic acid as killing agents, and recommends the use of a combined ether-yatren method in practice; (3) that "nerve tissue substance itself plays no part in the antigenic equipment of the material as used for antirabic immunization. It acts as inert matter, in this respect, and may be as well done away with. The clear supernatant liquid, obtained from brain emulsion, contains a large bulk of rabies virus and it is of the same antigenic value as the emulsion from which it was prepared."

A medicament of unknown constitution, and said by the Chinese sender to be a radical cure for rabies has been tested by REMLINGER and BAILLY.¹⁵ The tests were carried out on 4 dogs and 2 rabbits; all succumbed after the usual incubation periods.

D'AUNOY and FINE¹⁶ report that 372 persons were treated at New Orleans in 1931 and 230 in 1932, with Semple's vaccine. No mention

¹⁴ OKUWADA (Masaichi). Comparative Experimental Study of Various Methods used for Antirabic Preventive Treatment. (Report I.)—*Kitasato Arch. Experim. Med.* 1933. Oct. Vol. 10. No. 4. pp. 279-297.

¹⁵ REMLINGER (P.) & BAILLY (J). Un prétendu médicament chinois contre la rage.—*Bull. Soc. Path. Exot.* 1933. May 10. Vol. 26. No. 5. pp. 712-714.

¹⁶ D'AUNOY (Rigney) & FINE (Archie). Report of the Pasteur Institute of the Charity Hospital of New Orleans for the Years 1931-1932.—*New Orleans Med. & Surg. J.* 1933. Oct. Vol. 86. No. 4. pp. 236-238.

is made in the report of deaths from rabies or of post-vaccinal sequelae, but as the writers conclude from their experience that the method is "safe, effective and economical" it may be assumed that no untoward incidents occurred.

From the report of the Pasteur Institute at Tunis¹⁷ for 1932, it appears that of 1,150 persons treated, 6 developed rabies, 2 during treatment, and one before the 12th day after its termination.

The statistics of the German antirabic stations for the year 1932 are summarized.¹⁸ In all 97 persons received treatment (40 in Berlin, and 35 in Breslau), as compared with 174 in 1931. There were no deaths from rabies amongst those treated. With the exception of Breslau at which Semple's vaccine is used, the method of treatment employed was that of Hogyes-Phillips. One person treated at Breslau "who had a predisposition to diseases of the central nervous system" showed symptoms of paralysis during the second week of treatment (*vide infra* No. 23).

At Calcutta¹⁹ during the year 1931, 7,761 persons were treated; of these 43 died of rabies (0.55 per cent.). Reports regarding 67.9 per cent of those treated were received 6 months after the termination of treatment.

v. Rabies in Animals.

NEITZ and THOMAS²⁰ report that during the year 1932 18 cases of rabies occurred in South Africa. Of these, 3 were in human beings, 1 in a dog, 2 in oxen, 2 in domestic cats, 3 in *Genetta felina*, 6 in *Cynictis penicillata*, and one in *Suricata suricata*. A table and a map indicate the features of these cases, and their distribution.

An epizootic of rabies is reported from Catalunya (Spain) by ROIG.²¹ From 1922 to 1931 the number of cases of rabies in dogs never exceeded 115 (in 1925), and in 1931 it was 67. In 1932 the number rose to 210. A strain of virus was obtained from the brain of a dog which bit 14 persons and a horse. No negri bodies were found in the brain, but the strain behaved like a strain of fixed virus when injected into experimental animals. ROIG believes that it is a reinforced strain. He then goes on to discuss the prophylactic inoculation of dogs, and makes recommendations for the control of the local epizootic.

vi. Post Vaccinal Paralyses.

CORMACK and ANDERSON²² report an unusual type of post vaccinal accident occurring at Rangoon 5 or 6 days after the completion of

¹⁷ ARCHIVES DE L'INSTITUT PASTEUR DE TUNIS 1933 Apr. Vol. 21. No. 3 pp. 519-537.—Fonctionnement des services de l'Institut Pasteur pendant l'année 1932.

¹⁸ REICHS-GESUNDHEITSBLATT. 1933. July 5. Vol. 8 No. 27. pp. 494-495.—Die Tätigkeit der deutschen Wutschutzstationen im Jahre 1932. [Compiled by RODENBECK.]

¹⁹ CALCUTTA. Eighth Annual Report of the Pasteur Institute for the Year 1931 [NICHOLAS (M. J.), Superintendent].—22 pp. 1933. Calcutta: Bengal Secretariat Book Depot [Indian 8 annas: English 9d.]

²⁰ NEITZ (W. O.) & THOMAS (A. D.). Rabies in South Africa. Occurrence and Distribution of Cases during 1932—*Onderstepoort J. Vet. Sci. & Animal Industry* Pretoria. 1933. Vol. 1 No. 1. pp. 51-56. With 1 map.

²¹ ROIG I ROIG (M.). Estat actual de l'epizootia ràbica a Catalunya.—*Rev. d. Serv. San. i Demog. Municipals de Barcelona*. 1933. Vol. 5. No. 13. pp. 24-30. With 3 figs (1 map.)

²² CORMACK (H. S.) & ANDERSON (L. A. P.). Double Papilloedema following Antirabic Inoculation: Recovery—*Indian Med. Gaz.* 1933. Aug. Vol. 68. No. 8. pp. 459-460.

treatment by Semple's method. The symptoms were those of loss of vision, complete in the case of the left eye, and partial in the case of the right. The left pupil was quite inactive to direct light and there was no consensual reaction. Ophthalmoscopic examination showed a typical papilloedema of both discs. Improvement commenced at the end of the second week, and was complete after two months. The case was considered to be a sequela of treatment for the following reasons: (1) no other cause could be discovered, (2) the incubation period conformed to that of post vaccinal paralysis, and (3) on account of the "remarkably complete recovery from such a severe condition."

A probable case of paralytic accident following treatment by Semple's method at Breslau is reported by Bock.²³ The patient had an interesting history. In 1920 he attempted to commit suicide by shooting himself in the right temporal region. This was followed by transitory blindness of the right side. In 1931 he was in hospital and amongst other symptoms had increased reflexes in the left side and ataxy of the left hand. He was a heavy drinker. At the commencement of treatment he was nervous and weak. On the 8th day he complained of headache, dizziness, and weakness of the limbs. These symptoms increased, and treatment was suspended. Thereafter followed symptoms of spastic paralysis, increased reflexes, atrophy and ataxy of the lower extremities, and paralyzes of ocular muscles. The patient "is now improving." Though the cause of these symptoms might be ascribed to multiple sclerosis, or to functional disturbance, the probability that they may have had their origin in antirabic treatment cannot be excluded. The author then goes on to discuss the occurrence of such accidents in general. He draws attention to the fact that though treatment by killed vaccines reduces the risk of paralytic sequelae, it does not entirely exclude it. In other words one can no longer definitely ascribe such accidents to the presence of living virus as such. The causal factor would in his opinion appear to be an endotoxin of the virus of rabies, or a chemical constituent of the central nervous system of the rabbit. The influence of nervous predisposition would appear to be undoubted.

PATRIKIOS and CATACOUZENOS²⁴ describe four cases of nervous complications occurring after treatment by etherized vaccines. In two the symptoms were sensory. The other two showed symptoms of paralysis. In all four albumen was in excess in the cerebrospinal fluid. These cases show that accidents may occur even when vaccines are etherized. The etiology of paralytic sequelae appears to the authors to depend upon the biotropism of a special neurotropic virus.

GETZOWA, STUART and KRIKORIAN²⁵ give full details of the histopathology of the two cases of paralytic accident of the Landry type

²³ Bock (Harald) Ein Fall von wahrscheinlicher Impfpfählung nach Tollwutschutzbehandlung und kritische Bemerkungen zur Frage der Impfschädigungen.—*Zent f. Bakt. I. Abt Orig* 1933. July 11. Vol. 129. No 1/2. pp. 43-50. [17 refs.]

²⁴ PATRIKIOS (I.) & CATACOUZENOS (E.) Sur les complications nerveuses apparues au cours du traitement antirabique —*Bull. Soc. Méd.-Chirurg. d'Athènes*. 1933. Vol 18. No. 1. [In Greek. pp. 41-47. French summary (8 lines).]

²⁵ GETZOWA (S), STUART (G) & KRIKORIAN (K. S.). Pathological Changes observed in Paralysis of the Landry Type: a Contribution to the Histology of Neuro-Paralytic Accidents complicating Antirabic Treatment—*Jl. Path. & Bact.* 1933 Nov, Vol 37. No. 3. pp. 482-500. [21 refs.] With 4 plates.

which they previously reported (this *Bulletin* Vol. 30, p. 586) and of a further case of Landry's paralysis of entirely different origin. In a review one can only give a brief summary of their findings; for further information the reader is referred to the original beautifully illustrated paper. The appearances in all these cases were similar in type. "Paralysis is due to an affection of the ganglion cells, motor and sensory alike, an affection characterised by primary nuclear changes proceeding often to complete karyolysis and final cytolysis. . . . Between the normal ganglion-cell nucleus and its ante-mortem stage there have been encountered certain intermediate types which permit affected nuclei to be divided into three categories"—a clear basophilic type, capable of regeneration, a dark basophilic type, and a dark basophilic homogeneous type. In all three types karyolysis may occur. In addition to these fundamental ganglion cell changes, marked oedema of the grey substance, enlargement of perivascular and pericellular lymph spaces, engorgement of the small vessels, and oedema of the glia were observed. There was no evidence of focal lesions, of destruction of nervous tissue (apart from the ganglion cells), of demyelination, of change in the axis cylinders, of focal increase of neuroglia, of perivascular or pericellular aggregations, or of fat. "Such rapid involvement of the cerebrospinal axis, with nervous tissue destruction, diffuse indeed but strictly limited to ganglion cells, indicates the highly selective action of some toxin on these cellular elements of the central nervous system. The extreme activity of this toxin is best illustrated by the occasional speedy dissolution of water-clear, almost normal nuclei, while the occurrence, even if rare, of perfectly intact cell bodies, without nucleus or with a nucleus in an advanced state of degeneration, presupposes the existence of karyolysins and suggests their incrimination in a primary attack launched on the ganglion cell nuclei." They conclude that "the total absence in the central nervous system of perivascular zones of demyelination and of perivascular cuffing argues against the inclusion of antirabic treatment among the somewhat heterogeneous group of factors (small-pox, vaccinia, measles, varicella and typhoid) capable of producing acute disseminated encephalomyelitis (Westphal). It also argues against a virus theory generally." And finally, quoting from a previous paper by STUART and KRICKORIAN, they affirm that in so far as the causation of "accidents paralytiques" is concerned "there seems, in the basic nerve substance of all antirabic vaccines, to exist some deleterious component which, though adversely affected by various physical and chemical agencies, is still capable, in peculiarly susceptible individuals, of producing neuro-paralytic disorders."

vii. *Miscellaneous.*

GLUSMAN, SSOLOWIEWA and PREDTESCHENSKAIA,²⁶ in experiments carried out on 25 animals which had received alcohol in quantities varying from 200 cc. during 3½ months to 2,520 cc. during 11 months before they received antirabic treatment, observed no paralytic complications. A second experiment was carried out to check the result of REMLINGER and BAILLY (this *Bulletin*, Vol. 30, p. 143) that there is no evidence that alcohol has any influence upon the degree

²⁶ GLUSMAN (M. P.), SSOLOWIEWA (J. V.) & PREDTESCHENSKAIA (L. A.). Einfluss des Alkohols auf den Verlauf antirabischer Impfungen und die Ausbildung einer Immunität gegen Lyssa.—*Ztschr. f. Hyg. u. Infektionskr.* 1933. June 15. Vol. 115. No. 2. pp. 436-442. [11 refs.]

of immunity developed during treatment. The authors' experiment was carried out on 6 alcoholized and 4 control animals. The six alcoholized animals died of rabies after the usual incubation. Of the 4 control animals 2 survived. "The fact that a proportion of the control animals survived shows with certainty that in them the degree of immunity was higher than in the alcoholized rabbits." [On the assumption that the alcoholization had no effect, a result of this nature would be expected to occur about once in eight times. Hence the effect may be considered as insignificant. All the same the reviewer agrees with REMLINGER and BAILLY that "he will continue to recommend abstinence during the course of antirabic treatment, although there is no evidence that non-adherence leads to failure of treatment."]

Three rabbits were infected with *Toxoplasma caviae* and nine days later with fixed rabies virus, by NICOLAU and KOPCIOWSKA.²⁷ All died of rabies, with the usual symptoms. Negri bodies were found in their brains, and in addition cysts of the *Toxoplasma* were observed. Subpassages were made from two of the rabbits. The cysts disappeared immediately, and the concomitants of toxoplasma infection soon vanished; thereafter the passages were those of fixed virus. From a further experiment the authors conclude that previous infection with toxoplasma renders rabbits more susceptible to intra-ocular rabies infection. The practical effect of these experiments is that if accidental infection with toxoplasma occurs in the Pasteur institute, it may be rapidly eliminated by subpassage.

PLANTUREUX²⁸ has been unable to confirm BUSSON's result—that variola vaccine confers an immunity against rabies (this *Bulletin*, Vol. 24, p. 231). In experiments on 24 rabbits he has observed neither delay in incubation, nor alteration in the period of sickness.

A. G. McKendrick.

²⁷ NICOLAU (S) & KOPCIOWSKA (L.). Rage à virus fixe et *Toxoplasma caviae*.—*C. R. Soc. Biol.* 1933. Vol. 113. No. 24 pp. 855-857.

²⁸ PLANTUREUX (R.). Rage et vaccine—*C. R. Soc. Biol.* 1933. Vol. 113. No. 25. pp. 992-993.

MALARIA.

FEDERATED MALAY STATES. **Annual Report of the Malaria Advisory Board for the Year 1932** [KINGSBURY (A. Neave), Chairman] -- 16 pp. 1933 Kuala Lumpur: F.M.S. Govt. Printing Office.

Dr R. GREEN reported to the Board on the use of atebtrin. As regards the cost (see HOOPS, this *Bulletin*, Vol. 30, p 476), seven days' treatment with atebtrin should be compared with not more than seven days' treatment with quinine, because Asiatic patients will not stay in hospital longer. A course of 0.3 grams of atebtrin daily for seven days, as compared with a course of 30 grains of quinine daily for the same period, would cost about £2 more for every 100 patients treated. [But, from the figures given by Dr. GREEN the usual 5-day course of atebtrin would be about £2 cheaper than the 7-day course of quinine for every 100 cases.] A few patients complained of epigastric colic and supra-orbital headache after atebtrin treatment. Atebtrin did not act so quickly as quinine in subtertian malaria. Supplementary treatment with quinine was therefore advisable for the first 48 hours in severe cases. Like plasmoquine and stovarsol, it sometimes had a provocative effect in subtertian and might lead to an exacerbation in the first 48 hours. Atebtrin seemed superior to quinine in preventing relapses. In a series of 26 benign tertian cases treated for seven days with quinine, more than half relapsed within 3 months; but in a series of 32 treated with atebtrin there was only one relapse. Experiments with atebtrin as a clinical prophylactic have been carried out on estates with encouraging results.

Professor K. B. WILLIAMSON invited the attention of the Board to the expense involved in the use of petrol as a larvicide for well water. He pointed out that the addition of 1 per cent. turpentine greatly increased its spreading power. The malaria carrying mosquito of the hilly country, *A. maculatus*, invaded the new hill-station of Cameron's Highlands when roads were made and the place was being developed, but Professor WILLIAMSON reported that no adult *A. maculatus* had been captured there since October 1931, "and in controlled waters only one larva of this species, and none of other anophelines, had been taken. That result had been obtained in experimental areas without the use of oil and Paris green, but by sluicing, biochemical control, and the application of white clay." Hand-worked sluice-gates were cheaply made from packing cases. the rush of water created when they were opened got rid of the larvae. These gates were more effective than the 80-gallon automatic tipplers installed in some of the ravines, though the latter proved as useful as oil-spraying. Another method was the use of grass, chopped twigs, and green leaves which were piled 18 inches high and then trampled down into shallow seepage pools and drains. This method excluded light from the water, and polluted it. The results in the prevention of mosquito breeding have, so far, been very satisfactory. Masses of iron pyrites were placed at the bottom of ditches where mosquitoes were breeding and this was followed by a considerable reduction in their number, but the effect was by no means permanent. The sample used was found to contain 0.3 per cent. of arsenic.

Dr. E. A. STRUTHERS reported on successful subsoil drainage by means of short lengths of bamboo in place of earthenware pipes, a method which he recommended for inaccessible places, where transport was difficult and bamboos plentiful.

W. Fletcher.

LOWE (G. H.). **Malaria in Rice-Fields.**—*Malayan Med. J.* 1933. Sept. Vol. 8. No. 3. pp 190–192.

Anopheles hyrcanus is rarely a carrier in the Malay States, though it has been responsible for epidemics in Sumatra. The author describes three small outbreaks, in non-malarious parts of Johore, which were associated with the clearing of land for new rice fields and the subsequent prolific breeding of *A. hyrcanus*. (See HODGKIN, this *Bulletin*, Vol 30, p. 834) W. F.

ROBIN (L.). Recherches sur les variations saisonnières d'incidence de l'infection palustre en Indochine méridionale de 1926 à 1932. [The Seasonal Incidence of Malaria in Southern Indochina 1926 to 1932.]—*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. pp. 1076–1083.

The author concludes from the records of 37,000 blood examinations made at the Pasteur Institute, Saigon, during the period 1926 to 1932, that there are two waves of malaria in the year, one of which reaches its maximum in July, and the other in December. The December increase of malaria is coincident with an increase of *A. minimus*, the principal vector, and with the maximum infection rate of this anopheline, the July wave has no apparent association of this kind, there is an increase of *A. hyrcanus sinensis* at this time, but it appears to be only an occasional vector in Cochin China. The sick rate from malaria on estates situated within the region of hyperendemicity was 59.1 per cent. in 1928, but this has fallen to 11.22 as the result of anti-malarial measures, while the rate among the general population has remained fixed at about 17 per cent W. F.

MORIN (Henry G. S.) & BADER (H.). Sur l'indice carbonique des eaux de surface et ses rapports pendant la mousson de N.-E avec la distribution de l'endémie palustre au Tonkin. [The Carbonic Index of the Surface Water and its Connexion with Endemic Malaria in Tonking during the North-East Monsoon.]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1933 Mar.–Apr. Vol. 11. No. 2. pp. 192–198. With 1 folding map & 1 folding chart.

It has been recognized, as the result of some 400 analyses of water from different parts of Indo-China, that an increased ratio of $\frac{\text{CO}_2}{\text{alkalinity}}$ favours the breeding of *A. minimus*, *A. maculatus* and *A. jeyporiensis*, which are the vectors of malaria in Indo-China. This index reaches very different figures in different parts of the country, and is subject to wide fluctuations with the different seasons. It is higher in the spring than in the north-east monsoon which lasts from the middle of October to the middle of April. It is very high in the deadly malarious highlands of the interior, reaching figures of 60 to 80 in some of the streams, and dropping down to 30 or less in the large rivers as they approach the plains. In the non-malarious delta of the rice-fields it falls to zero, or less, and then rises again to as much as 30 among the estuaries and river-mouths of the coast, where the water is brackish and malaria occurs. W. F.

TOUMANOFF (C.). Quelques faits nouveaux concernant le rôle de la variété tonkinoise de *A. jeyporensis* James dans la transmission du paludisme. [*A. jeyporensis* James a Transmitter of Malaria in Tonking.]-*Bull. Soc. Méd.-Chirurg. Indochine*. 1933 May. Vol. 11. No. 3. pp. 309-312

The author concludes that *A. jeyporensis* James must be regarded, with *A. maculatus*, as an important auxiliary vector in regions of high endemicity in Tonking, the chief vector being *A. minimus*. This conclusion is based on the dissection of 826 specimens of *A. jeyporensis*, 6 of which he found infected, some with sporozoites

W. F.

KAUNTZE (W. H.) & SYMES (C. B.). *Anophelines and Malaria at Taveta*.—*Kenya Med. Dept., Records of Med. Research Lab*. No. 5. 26 pp. With 1 folding map & 2 charts.

Immunity of men, women and children of a tribe living in a hyperendemic area, but a very high infantile mortality.

The Taveta Native Reserve is situated in the low, hot plain to the south-east of Mount Kilimanjaro, at an altitude of 3,000 feet. Through it runs the Lume River, bordered by a belt of luxuriant tropical forest—damp and steamy, and full of streams. Outside the forest, is a plain covered with thorn bush. The Wataveta, who live in this reserve number between two and three thousand, but before the war, in 1913, there were 5,870 of them. In 1925 there were only 2,142, and since then, there has been only a slight increase in their numbers. Malaria is hyperendemic, and there is nearly twice as much within the forest as there is outside, half a mile from the river; but, even there, a mission station was moved four times and finally evacuated of all European staff after two missionaries had died of blackwater fever. The initial drop in the number of the Wataveta, after 1913, probably resulted from the intense disorganization of the community during the prolonged hostilities in the area. Since the war, confinement of the greater part of the tribe to the unhealthy forest, and the social conditions under which they live, have prevented all but the slightest increase in their numbers. The frequent practice of abortion is another factor; CALLANAN states that a girl before marriage has on an average eight to ten abortions artificially produced. The men do no work beyond making beehives. The main article of food is the banana, but there is a varied supply of foodstuffs, and the tribe is well fed. "The hyperendemic malaria . . . must necessarily have influenced birth and death rates very considerably." The infant death rate is probably about 60 per cent. The malaria vectors are *A. costalis* in the country outside the forest, and *A. costalis* and *A. funestus* within it. Cows are kept in the huts, day and night, until they become almost blind and their leg-muscles atrophy for want of use, but the mosquitoes show no inclination to neglect the human inhabitants in order to feed on the cattle.

In spite of the hyperendemicity of malaria, the Wataveta are apparently largely immune from its effects, if one excepts the high infant mortality, for one of the authors reports "the Wataveta observed by me, men, women and children, looked as healthy as any tribe I have yet seen. Certainly they complain of attacks of *homa* (fever) but these are apparently transient."

W. F.

SENEVET (G.) & COLLIGNON (E.). Apparition précoce d'*Anopheles hispaniola* en Algérie. [Early Appearance of *A. hispaniola* in Algeria.]—*Arch. Inst. Pasteur d'Algérie*. 1933. Sept. Vol. 11. No. 3. p. 464.

In thirty years' experience Et. SERGENT has never known *A. hispaniola* make its appearance before July; it is regarded as autumnal. The authors took larvae of this species this year in April, and in May and June they became very numerous. This ante-dating of the usual appearance by three months is attributed to a warm and dry spring.

A. G. B.

LODATO (Gaspere) Le donne fezzanesi e la malaria. [Malaria among Fezzanese Women.]—*Arch. Ital. Sci. Med. Colon.* 1933. Nov. 1. Vol. 14. No. 11. pp. 744-748. English summary (5 lines).

Observations carried out at Fezzan (Tripolitania) in the course of an antimalaria campaign revealed the fact that in two localities specially studied, the men and children suffered severely from malaria; about 96 per cent. of the infants, 70 per cent. of the young boys and 50 per cent. of adult men, but only 7 to 9 per cent. of the women.

This enormous difference is accounted for partly by the clothing, or rather the absence of it among infants, boys and men, but more by the fact that the women are accustomed to anoint themselves with cosmetic preparations having a pungent odour, mostly that of oil of cloves, which act as repellents to anopheles. The constituents and mode of preparation of eleven of these are given. [From this it will be seen that they are more potent than the oil of citronella, the favourite local repellent in most tropical countries.] H. H. S.

TRINIDAD AND TOBAGO. Council Paper No. 32 of 1933. **Malaria Survey for 1932.** Report of Dr. ERIC DE VERTEUIL, A.M.I.H.—27 pp. With 7 plans & graphs & 8 figs. on 4 plates. 1933. Port-of-Spain. Govt Printing Office. [2s. 9d.]

Malaria in Trinidad is chiefly due to the breeding of *A. tarsimaculatus* in mangrove swamps and rice-fields where drainage has been obstructed. *Anopheles* successfully transported to London in banana storage room.

Judging from the tables in this report, malaria is severe only in certain districts. In 480 films taken at random from children and adults, the parasite rate was only 0.8 per cent, and in 306 films from school children, it was only 2.9 per cent. Within limited areas, especially in the neighbourhood of mangrove swamps where there has been interference with the natural drainage, malaria is rife. *A. tarsimaculatus*, the principal carrier, breeds most happily in water with a salinity equal to 20 to 45 per cent. of equatorial sea-water, and will breed in water containing from 1 per cent. up to 68.7 per cent. Anopheline larvae are not found in the mangrove swamps open to the sea, but where the waves have thrown up an obstructing sand-bank across an estuary or the mouth of a river, the salinity behind it is reduced, and anophelines breed there. In other places, the natural drainage has been obstructed by road or railway embankment, and swamps have formed in consequence. "In those swamps however where sea-water has been admitted and has free play daily in and

out owing to defective sluice gates, or canalization, no mosquito breeding occurs." The author recommends the installation of culverts to drain the swamps at low tide and to admit the sea at high tide, thus maintaining a salinity of 80 per cent. sea-water.

Another cause of malaria is the rice-fields, because the main drainage channels and rivers are obstructed in order to irrigate them. "The rice fields of Trinidad show as good an example of man-made malaria as could be obtained anywhere" It appears that there are "two different varieties of *tarsimaculatus* . . . *var. aquasalis* and *var. aquacoelestis*." The first breeds in brackish water, the latter breeds in sweet water. The *aquacoelestis* variety has been identified with the Brazilian species *A. oswaldi* Peryassú.

Six batches of anopheles have been sent from Trinidad to London in Barraud's cages. The earlier batches were sent with raisins on the top of the cage for food, but many of the insects developed moulds in their stomachs and the remainder refused to feed when they arrived. Later batches were blood-fed on the day of embarkation and dispatched, in a semi-hibernating condition, in the storage room of banana boats, at a temperature of 53°F. (See BROWN, below, p. 167.) The latter method was successful.

W. F.

MISSIROLI (A.). Tipo epidemico delle febbri malariche si nel nord d'Italia. (**Epidemic Type of Malaria Fever in Northern Italy.**)—*Riv. di Malarologia*. 1933. July-Aug. Vol. 12. No 4. pp. 675-688. With 4 graphs. English summary (4 lines) p. 836.

The author calls to mind CELLI's three epidemic types of malaria, those of Northern Europe, North Italy and South Italy. He then describes the conditions as he finds them in Lison, Concordia and the district north of the Piave and Livenza rivers. The prevailing mosquitoes are five "races" of *A. maculipennis* (*maculipennis*, *labranchnae*, *messeae*, *atroparvus* and *elutus*) and the numbers caught were greatest, 9,694, in July, next 5,310 in August, 3,888 in September and 4,059 in October; thereafter they were much fewer, in November to March successively 252, 196, 28, 15 and 11. The cases of malaria recorded during the year totalled 623, of which 404 were benign tertian, 207 malignant tertian and 12 quartan. It was found that benign tertian patients were more numerous in April, May, and June and that the percentage of gametocyte carriers was highest in May, whereas Anopheles were most prevalent in July. Professor Missiroli observes that malignant tertian dies out at the end of spring, no cases being found among patients examined in May and June. At Portogruaro in the same locality in 1932 the highest rate of *P. vivax* schizont carriers occurred in September-November.

The author concludes that :—

1. The annual curve of benign tertian patients rises slightly in the spring and markedly in the summer-autumn months.

2. Malignant tertian tends to die down (*esaurirsi*) at the end of spring.

3. In the epidemic aestivo-autumnal period *P. vivax* is the predominant parasite, though *P. falciparum* is present also.

4. Benign tertian infections manifest themselves as a rule only in the year in which they are contracted.

H. H. S.

WALCH (E. W.). **On the Relation between the Preference for Animal or Human Blood of Netherland-Indian Anopheles and their Ability to transmit Malaria under Natural Conditions.**—Reprinted from *Acta Brevia Neerlandica de Physiologia*. Amsterdam. 1932. Vol. 2. pp 206-210.

Precipitin tests show that *A. ludlowi* and *A. sinensis* are not diverted from man by the presence of cattle, but that *A. maculatus* and *A. aconitus* are so diverted.

The author applied precipitin tests to anopheles caught in native houses in south Sumatra. *A. ludlowi* is the most dreaded malaria transmitter in the Dutch East Indies, and *A. sinensis* is the chief carrier in the interior of south Sumatra. As regards these two species, their preference for man was so pronounced that it made little difference whether cattle were present or not. In places where there were few cattle, 94 per cent. *A. ludlowi* and 90 per cent. *A. sinensis* contained human blood. In places where there were plenty of cattle the figures were 86 and 83 per cent. To these two androphilous species the author adds *A. leucosphyrus*, a carrier in Sumatra and eastern Borneo, *A. punctulatus*, a dangerous vector in the Moluccas, and *A. umbrosus*, an important transmitter in the interior of western Borneo. *A. maculatus*, the malaria carrier of the Malay States, fed on man when cattle were scarce—97 per cent. contained human blood—but they were diverted from man when cattle were numerous, and only 11 per cent. contained human blood. *A. aconitus* behaves similarly. Thus the presence or absence of cattle may explain why these anopheles are carriers in some places, but harmless in others. W. F.

CARDAMATIS (Jean P.). Relation entre les conditions météoriques et le paludisme en Grèce. (**Relations between the Meteorological Conditions and Malaria in Greece.**)—*Riv. di Malariologia*. 1933. July-Aug. Vol. 12. No. 4. pp. 689-700. English summary (8 lines) pp. 836-837.

There was a great reduction in anophelism and malaria in Greece during the year 1932; this was in part, due to the regulation of water courses and, in part, to the provision of a public water-supply which rendered the domestic storage of water unnecessary; but a similar reduction occurred in places where no sanitary improvements had been made, and the author concludes that the main cause was the exceptional dryness and heat. W. F.

CHRISTOPHERS (S. R.) & MISSIROLI (A.). **Report on Housing and Malaria. Being a Summary of What is Known about Anophelism in Relation to Housing and Malaria.**—*Quart. Bull. Health Organisation, League of Nations*. Geneva. 1933. Sept. Vol. 2. No. 3. pp. 355-482. With 4 figs. [17 pages of refs.]

"Screening is the one salient feature of house character which is important and effective. Next to screening in importance is the overhead fan."

Much has been added to our knowledge, especially in connexion with the differentiation of races of *A. maculipennis*, since the publication of Clayton LANE's paper on "Housing and Malaria" (this *Bulletin*, Vol. 28, p. 979). It now appears that improved construction of houses, improved agricultural conditions, and the introduction of larger numbers of cattle are not equally effective in all areas, and

that their action in this respect is more or less limited to districts in which the anopheline carriers are certain zoophilous races of *A. maculipennis*. ROUBAUD, in 1919, concluded that cattle drew away anopheles which would otherwise have fed upon man; later, he modified this view and distinguished special zoophilous strains of *A. maculipennis* which he supposed were formed by the selective effect of habitual feeding on cattle housed under certain conditions. It is now generally recognized that the zoophilous strains are not developed in this way, but are indeed different varieties of *A. maculipennis* from those which prefer to feed on man—varieties distinguishable not only by their food-preferences, but also by differences in morphological characters, especially as regards the egg. The authors consider the term "races" as applied to the different forms of *A. maculipennis* as being ambiguous, and they regard them as "varieties" in the ordinary entomological sense, "even though the characters given in the differentiation of the adult and larva are not so definitive as might be desired, the differences in the egg appear quite reliable and sufficient." The zoophilous varieties are var. *messeae*, Falleroni, and var. *maculipennis*; these varieties are but little associated with man and, in the winter, they hibernate completely, neither laying eggs nor sucking blood. The androphilous varieties are var. *atroparvus*, van Thiel, found in Holland and Italy, and var. *labranchiae*, Falleroni, found in central and south Italy. These two varieties feed on man as well as on animals, and they do not go into complete hibernation, for though they cease to lay eggs they continue to suck blood. A synoptic table of the main morphological characters of these four varieties is given, illustrated by plates. It appears doubtful if there are similar varieties in other species, and the existence of zoophilous varieties among tropical anopheles has not been established.

"Certain regions in Europe once indisputably regions of endemic malaria have . . . become malaria-free in spite of the continued presence of anophelines. This disappearance has been ascribed in France to improved agrarian conditions leading to a more normal life of *A. maculipennis* as associated with cattle rather than man. In England, it has been ascribed to progressive improvements of a social . . . character and especially to the change in type of habitation." [See JAMES, this *Bulletin*, Vol. 27, p. 626.] The work of HACKETT, MARTINI, and MISSIROLI, however (*loc. cit.* Vol. 29, p. 832) has shown that the disappearance of malaria from certain endemic areas in Europe is largely dependent upon the absence of the malarious varieties of anopheles, namely *atroparvus* and *labranchiae*. Malaria disappears from those places in which only the zoophilous varieties, *messeae* and *maculipennis*, occur, when agrarian development, deviation from man by cattle, and other changes, such as the provision of glass windows for houses, lessen the contact between anopheles and man.

JAMES ascribed the malaria of certain houses in *maculipennis* countries, known as "malaria houses," to the habit acquired by mosquitoes which had lived long enough to become infected, of remaining for weeks or months in the same house, or of returning to it after every flight. It has, however, been shown that under normal conditions, especially in the tropics, anopheles remain only an extremely short time in a house, and, if they return to it, they do so only by accident and infrequently. Nevertheless, over a very large tract, including the northern parts of America, Europe and Asia, varieties of *A. maculipennis* which exhibit semihibernation continue to feed, and, as

they have ceased to lay eggs, do not leave the house during the winter. It is doubtful if the construction and character of a house in the tropics are in any way responsible for its becoming a "malaria house." This is more often due to the proximity of breeding grounds, or to reservoirs of virus in the form of native children living in neighbouring coolie lines, or to the low social and mental status of the inmates. "The 'house' cannot be considered as an isolated proposition apart from its environment Situation of a house is the first line of defence against malaria Select a situation where breeding-places within a distance of half a mile can be most readily controlled In the case of a single bungalow avoid a situation between a large aggregation of habitations and important breeding places." In many tropical countries, the neighbourhood of a native reservoir of infection is the predisposing cause of malaria and the segregation of Europeans must be considered an essential feature in the improvement of housing.

"That screening in the tropics has not been more thoroughly and systematically taken up than it has is remarkable . . . screening is the one salient feature of house character which is important, and from a preventive point of view effective." "It is doubtful how far improvements in construction, apart from the admitted value of screening would be really effective against malaria Construction . . . does not . . . discourage entry of anopheles Improvement in the type of house even if it had an effect in reducing malaria could scarcely be considered a reason, in a dangerous malarious area, for not completing protection by screening Electrically driven fans should be provided wherever possible. . . . In all cases the essential point should be screening with the necessary free and open passage of air." By this means, mainly, it has been possible to re-colonize the notoriously malarious parts of the Pontine Marshes. "The use of electrically driven overhead fans associated with screening is an enormous advantage. . . . The use of overhead fans in screened barracks has given excellent results in India In blackwater-fever areas, it is the chief hope of combating this disease. . . . Any question whether a house by its open and well-ventilated condition is made less suitable to malaria becomes less important by the fact that, if malaria does exist, it is the proper procedure to screen the house. . . . Next to screening in importance is the overhead fan."

It does not appear likely that much could be done by improved house construction or screening for the indigenous inhabitants of malarious tropical countries who live in a state of low civilization. Many millions live in huts, yet it is extremely doubtful if improved construction, or even screening would modify the incidence of malaria without fundamental changes in the lives and habits of the people. "It must be admitted that, as yet, any relation between effective malaria prevention and improvement in housing of indigenous rural populations in many non-European countries . . . does not seem apparent to the authors."

W. F.

RUSSELL (Paul F.). *Lectures on Malaria Prophylaxis and Mosquito Control.*—*Jl. Philippine Islands Med. Assoc.* 1933. June, July & Aug. Vol. 13. Nos. 6, 7 & 8. pp. 277-288; 339-351; 381-391. [31 refs.]

Malaria cannot be reduced by drugs. Anti-larval measures are necessary. Money is insufficient for prompt control. Work must be

continuous like road cleaning. Mosquito nets most important. Method of measuring the mesh.

These lectures are so excellent that it will be surprising if they are not collected in book form. Only a few extracts can be given here. The author states at the outset that "disconcerting though it be, there is to-day no known method for eradicating malaria in the tropics promptly, at a cost within the means of the people"; but, "given plenty of money, effective control can be accomplished, despite all handicaps, in a relatively short time. On the other hand, with plenty of time it should be possible to control malaria without spending much money, provided the will to control is present." Mosquito control gives much better results than drug control. Though quinine has saved many lives, "there are few if any records of successful malaria control by the use of drugs alone." Though quinine taken prophylactically is a practical method of maintaining the efficiency of temporary expeditions into hyperendemic areas, "it may be stated definitely that quinine as a prophylactic drug is a failure." Prompt and adequate quinine treatment of all cases would undoubtedly help in reducing the incidence of malaria in a community, but patients cannot be trusted to take it "Even with one inspector for each individual it is doubtful if success could be achieved—such is the frailty of human nature." As regards the recommendation of the League of Nations Malaria Commission that mosquitoes in houses should be sought out and killed daily by housewives, in tropical areas "no doubt the results would be astounding *if* mosquito vectors would only stay in houses and *if* housewives and children would only spend time killing them," but in the Philippines and in many other tropical countries the mosquitoes which carry malaria do not remain in the houses in the day-time. It is unlikely that malaria can be controlled in the Philippines without anti-larval measures, but except on estates and in prosperous communities the cost is almost prohibitive. A cheap method of dealing with stream-breeders is to dam the stream, storing water behind the dam for two or three days, and then releasing it. Some of the larvae are dried up, others are washed away by the rush of the released water. By using devices such as this and automatic distributors of Paris green (see this *Bulletin*, Vol. 30, p. 864) costs may be reduced. In some places the municipality could hire a full-time labourer "to spread Paris green in the malaria-producing streams week by week for the next 25 years. This could be done as routinely as street-cleaning . . . To succeed, it is my opinion that malaria control must be carried on by local labour under local supervision, paid by local appropriations." The widespread use of quinine, atabrin, and quinoplasmine should be encouraged as an adjuvant to other methods, and the central government should supply the drugs free.

As regards educational propaganda, it is the author's opinion that this should be very largely confined to the subject of mosquito-nets. Clear information is given as to the construction and hanging of nets, and also for determining the mesh. If one examines "netting closely one sees that the holes are parallel horizontally and also diagonally, but are not side by side vertically, . . . the threads of the warp are more compactly arranged than are those of the woof, . . . one first decides which is warp and which is woof . . . with a hand lens. Then one square inch of netting is marked off and the holes along the line of the warp are counted and this count is added to

the number of holes along the woof. An easy method is to cut a hole, one square inch in size, in a piece of thin cardboard. This is then laid upon the netting so that the bottom edge is along a line of warp holes and the left-hand corner at the intersection of the horizontal warp and a diagonal woof line. The mesh is the sum of the number of holes along the bottom edge of the square and the number of holes of the diagonal. The hole at the intersection is counted twice . . . In general, it is true that cotton netting having 25 to 26 holes, as counted above, made either of what in the trade is called "30/s" thread, or of "40/60" thread will exclude mosquitoes." (See this *Bulletin*, Vol. 29, p. 691.) W. F.

- i. CANTACUZÈNE (J.), OTTOLENGHI (D.), SWELLENGREBEL (N. H.) & PITTALUGA (G.). **General Observations on Malaria in Deltas.**—*Riv. di Malarologia*. 1933. Sept.-Oct. Vol. 12. No. 5. pp. 980-984.
- ii. SOCIÉTÉ DES NATIONS. ORGANISATION D'HYGIÈNE. Paludisme dans les Deltas.—39 pp. With 6 figs. [39 refs.] C.H./Malaria/208. Geneva. 1933. Sept. Delta du Rhin [SWELLENGREBEL (N. H.)] pp. 1-32. Considérations générales sur le paludisme dans les Deltas ["Comité des Deltas" de la Commission du Paludisme de la Société des Nations] pp. 33-39.
- iii. SWELLENGREBEL (N. H.) Le paludisme dans les deltas. (Etudes sur le paludisme dans le delta du Rhin.) [*The Malaria of Deltas.*]—*Arch. Roumanes Path. Expér. et Microbiol.* Paris 1932. Dec. Vol. 5. No. 4. pp. 643-679. With 6 figs. [39 refs.]
- iv. —. **Studies on Malaria in the Rhine Delta.**—*Riv. di Malarologia*. 1933. Sept.-Oct. Vol. 12. No. 5. pp. 953-979. With 6 figs. [39 refs.]

A most interesting and illuminating survey of brackish water, *atroparvus*, malaria in Holland, and of the hypothesis of gonotrophic dissociation. The summary (of iii.) does not do it justice.

The Netherlands forms the delta of the Rhine. At the beginning of the Christian era the coast line was continuous, but, in the middle ages, there was a tremendous inundation which resulted in the formation of the Zuyder Zee. Since then, much land has been gradually recovered by the method of "polders," in which an area is enclosed by banks, and the water contained within them is collected into ditches and pumped out by windmills or electric pumps. After the great inundation, the present province of North Holland consisted of little more than a chain of dunes along the edge of the North Sea. The low land which now lies between these dunes and the salt-water Zuyder Zee is thoroughly impregnated with brackish water which percolates through the banks and fills the ditches in the polders. *Anopheles maculipennis* is widely distributed throughout Holland, but the incidence of malaria does not coincide with this distribution, for it is limited to the brackish water areas. In the province of North Holland, malaria is endemic, and, in the epidemics which occur about every 20 years, some 20 per cent. of the population becomes infected. In the adjoining province of South Holland, where the water is not brackish, there is no malaria although anopheles are numerous.

The idea that a mixing of the salt water of the sea with the fresh water of the rivers causes malaria is a very old one, both in Holland and in Italy. De Voer found the same thing on the North coast of Java.

where malaria was similarly limited to regions of brackish water. He attributed it to the influence of the water upon the anopheles which made them more susceptible to infection with malaria parasites. Subsequently it was shown that the real cause was the presence of a special salt-water-breeding mosquito, *A. ludlowi*. Similarly VAN DER HOEVEN, who noticed that the anopheles of North Holland were smaller than those of the non-malarious areas, thought that this was due to the deleterious effect of the salt water upon the larvae, and that the feebleness and small size of the resulting adults rendered them more prone to infection, and also (because they were too feeble to puncture the thick hides of animals), more prone to feed on man. It has now been shown that this is not correct, but that, as in Java, there is one special mosquito (*Maculipennis* var. *atroparvus*) of the malarious salt water districts, and another (*Maculipennis* var. *messeae*) of the non-malarious fresh water districts. This *messeae* is probably identical with the *messeae* of Italy, but it is doubtful if *atroparvus* is the same as the Italian *labbranchiae* (see VAN THIEL, this *Bulletin*, Vol. 30, p. 831). Both these varieties feed on man and animals throughout the summer, and they both prefer animals to man. They leave the house or stable after feeding, and, if one of them should happen to become infected, the chances are that its subsequent feed will be on an animal, for mosquitoes in Holland are deviated from man by enormous numbers of pigs; indeed the author thinks that if this barrier were removed, both varieties of *A. maculipennis* would transmit malaria in the summer. But, under present conditions, the malaria season in Holland occurs in the spring, before anopheles are about, and sometimes there is a minor rise in the autumn, which, as KORTEWEG has shown, foretells a large outbreak of malaria in the following spring.

Var. *messeae* of the non-malarious districts is as easily infected as var. *atroparvus*, it is no more unwilling to feed on man, and, during the summer it behaves in the same way: but, in the autumn, it goes into complete hibernation. That is to say, it neither lays eggs nor sucks blood, and there is complete "gonotrophic concordance." Var. *atroparvus*, on the contrary, does not go into complete hibernation; it retires to the shelter of a house or stable, but though it ceases to lay eggs it does not cease to suck blood. Here there is "gonotrophic dissociation," and as *atroparvus* does not leave its shelter to lay eggs, it remains in a house, feeding repeatedly for long periods, and thus it infects the inmates. These transmissions occurring in the autumn and winter produce latent infections which cause the spring malaria of Holland. When the anopheline density is abnormally high, some people have so many sporozoites inoculated into them that fever occurs within the normal incubation period instead of after several months, thus producing KORTEWEG's autumn rise which foretells more malaria in the following spring, because it is, itself, a sign of abnormal anopheline density.

The large salt-water lakes are not dangerous; but, when these are reclaimed, *atroparvus* breeds in the brackish water of the ditches within the polders. Malaria in the Rhine Delta is thus made by man. Though reclamation causes malaria in the reclaimed area it protects the hinterland from the infiltration of salt water, and thus makes it more healthy. The malaria of the province of North Holland is due to reclamation, but this same reclamation has brought about the disappearance of malaria in South Holland by the substitution of fresh water for brackish, and the consequent disappearance of *atroparvus*.

There is now "anophelism without malaria" in South Holland, because the anopheles belong to the variety *messeae*.

A scheme is in progress for protecting the new land which is being reclaimed from the Zuyder Zee, by the construction of a great dam across its mouth to keep out the sea, and the formation of a fresh-water lake in the middle, from the waters of the river Yssel.

As in Holland so in other parts of the world, deltas have been made malarious by man. In the delta of the Ganges, for example, the construction of embankments has prevented the silt-laden water from inundating the land in the western portion, and there malaria is rife. In the eastern part of the delta, the muddy water flows freely over the land, but no malaria-carrying mosquitoes breed in it until the silt has settled; this does not occur until November, too late in the year for transmission to take place, and this eastern part of the delta is perfectly healthy (this *Bulletin*, Vol. 28, p. 573) W. F.

TUNISIE MÉDICALE 1933. Nov. Vol. 27. No. 9. pp. 375-438.

With 3 plates & 3 figs—Numéro consacré au paludisme (2me partie). [9 papers.] [**Malaria Number.**]

Dr. Marcel SICART deals with the seasonal variations in the proportion of the different species of malaria parasite in the northern part of Cap Bon. *P. malariae* is commonest in the cold weather, *P. vivax* when it is a little warmer, and *P. falciparum* when it is very hot. Infection with *P. malariae* is fairly constant, but it is masked by *P. vivax* in the spring and by *P. falciparum* in the autumn. Dr. R. DUPOUX counsels his colleagues not to be afraid of giving quinine to pregnant women, because malaria is far more dangerous than the drug. Dr. C. MARINI draws attention to the infantile mortality from malaria. Dr. M. KROUCH criticises the method of prophylaxis which is based on the examination of smears taken only from those whose spleens are enlarged. Where this is done, many carriers remain undiscovered and untreated. He also comments upon the infection of infants under one year of age in 50 per cent. of whom he has found parasites; he points out their danger as reservoirs of infection, because they are rarely examined and treated. He finds that the numerous bands of nomads who are the most poverty-stricken of the Tunisian population, are not only a public danger as regards plague and cholera, but also as regards malaria. He has found atebirin in small daily doses of 0.1 gram less efficient and more costly than quinine in doses of 0.2 gram (3 grains). Dr. A. SANTILLANA deals with malaria among children, and Dr. C. SPEZZAFUMO with the different means by which a latent infection may be made manifest W. F.

FAGET (G. H.). **Malarial Fever in Narcotic Addicts: its Possible Transmission by the Hypodermic Syringe.**—*Public Health Rep.* 1933. Aug. 25. Vol. 48. No. 34. pp. 1031-1037.

There was an unusual prevalence of malaria among the narcotic addicts who were patients in the United States Marine hospital at New Orleans during the winter of 1932-33, several others died from malaria in the City, and a similar outbreak occurred at Galveston. The presence of the disease in this special class, and its occurrence during the non-malaria season made it probable that the infection was conveyed by the hypodermic syringe.

It was found on enquiry that the usual practice was to inoculate the drugs intravenously with a needle fitted on to a medicine dropper—the joint being luted with cigarette paper. The “dope” was often prepared in sufficient quantity for several persons to have their injections at the same time. When a “shot” was being given, a little blood was allowed to flow into the syringe, in order to show that the vein had been entered, and it was passed on to the next man without washing. This method of spreading malaria is of importance in the United States, where it is estimated that one person in every thousand is a drug addict [See BIGGAM, this *Bulletin*, Vol. 27, p. 202, and EATON, below] W. F.

EATON (L. McKendree) & FEINBERG (Samuel M.). **Accidental Hypodermic Transmission of Malaria in Drug Addicts.**—*Amer. Jl. Med. Sci.* 1933 Nov. Vol. 186. No. 5. pp. 679–683. With 2 figs.

In the year 1932, 35 per cent. of the malaria patients were drug addicts, and, during the first five months of 1933, 6 out of the 9 cases of malaria admitted to the Cook Hospital in Chicago were drug addicts. The method of self-administration was that described by FAGET (see above). Malaria among drug addicts maintains the same level throughout the year, whereas naturally acquired malaria occurs in waves. W. F.

KORTEWEG (P. C.). Waarnemingen bij kunstmatig opgewekte malaria. Verschillende stammen van *Plasmodium vivax*. [Induced Malaria with Two Strains of *P. vivax*].—*Nederl. Tijdschr. v. Geneesk* 1933, Oct. 7. Vol. 77. No. 40. pp. 4547–4570. With 6 figs. [Refs in footnotes.] English summary.

Infections caused by a Dutch strain differed from infections caused by a Madagascar strain in the duration of incubation, type of fever, immunity reactions, response to salvarsan and number of merozoites.

Observations were made on 562 cases of induced benign tertian malaria. Some were infected by blood inoculation (“blood malaria”) and others by the bites of mosquitoes (“mosquito malaria”). Two strains of *P. vivax* were employed—strain H from Holland and strain M from Madagascar. Relapses never occurred in blood malaria, but mosquito malaria was more complicated and relapses were frequent.

The fever was higher in infections with the H strain. Patients immune to this strain were not immunized against the M strain. The number of merozoites was greater in the M strain. The M strain was more susceptible to treatment with salvarsan. In mosquito malaria, the average incubation periods were 21 days with the H strain and 12 with the M strain. Long latency occurred in 38 per cent. of the H and 7 per cent. of the M cases. The H strain produced mainly tertian fever, but, with the M strain, the fever was quotidian from the onset. W. F.

BOYD (Mark F.) & STRATMAN-THOMAS (Warren K.). **Studies on Benign Tertian Malaria. 3. On the Absence of a Heterologous Tolerance to *Plasmodium vivax*.**—*Amer. Jl. Hyg.* 1933. Sept. Vol. 18. No. 2. pp. 482–484.

Premunition is not heterologous.

Two patients who had been infected with the McCoy strain of benign tertian, and who had recovered spontaneously from the fever but still

had parasites in their blood, were bitten by mosquitoes infected with the Hughes strain of *P. vivax*. On the sixteenth day, in each case, the number of parasites began to rise and on the following day an attack of malaria began. "Even when appreciable numbers of *P. vivax* are present in the peripheral circulation, a patient with a latent benign tertian infection does not possess a heterologous tolerance to other strains of this parasite." W. F.

BOYD (Mark F.) & STRATMAN-THOMAS (Warren K.) **Studies on Benign Tertian Malaria. 4. On the Refractoriness of Negroes to Inoculation with *Plasmodium vivax***—*Amer. J. Hyg.* 1933. Sept. Vol. 18 No. 2. pp 485-489

The authors have never failed to produce infection in white patients by the application of four infected mosquitoes, but among six negroes who were bitten for the purpose of inducing therapeutic malaria at the Florida State Hospital, three remained uninfected, and the attacks in the other three lasted only a few days. In a subsequent experiment two negroes were each bitten by 16 infected mosquitoes and 12 white controls were bitten by not more than one. The negroes remained free, but all the controls were infected. In a third experiment, an attempt was made to infect a negro child 5 years of age, but here again the negro remained free while the white controls contracted malaria. The authors conclude that the resistance is probably racial rather than acquired. W. F.

GIGLIOLI (Giorgio). Contributo allo studio delle associazioni morbose della malaria: malaria ed ileotifo; malaria e paratifo C. (**Contribution to the Study of Associations of Malaria with Other Diseases: Typhoid and Paratyphoid C.**)—*Riv. di Malariologia.* 1933. July-Aug. Vol. 12, No. 4. pp. 708-717. With 1 chart. [15 refs.] English summary p. 837.

The author has had much experience of malaria and enteric infections in British Guiana and this article is an interesting contribution to the fascinating subject of mixed protozoal and bacterial infections.

He begins by referring to SCOTT's work on coincident enteric fever and malaria in Jamaica (this *Bulletin*, Vol. 15, p. 252) where each is a severe condition separately but combined may cause but little disturbance. Dr. Giglioli's paper is based on 12,502 cases of malaria, 50 of typhoid fever and 142 of paratyphoid C in the course of nine years. In his experience typhoid and malaria together have no mutual influence inimically or otherwise, each apparently runs its course without any interaction, and malaria parasites were seen in the blood of 28.5 per cent. of his typhoid patients.

With paratyphoid C, however, there is undoubted inter-relation. Whereas usually this is a comparatively, sometimes exceedingly, mild condition, when malaria is present also, or in times of a malarial epidemic, the paratyphoid assumes great virulence resulting in death in certain cases. He quotes the figures from November 1926 to the following August, when among 78 patients with *Bact. paratyphosum* C infection there were 30 deaths and outside the hospital in the less accessible districts many died during the same period. H. H. S.

SCHILLING (Claus) & NEUMANN (Harry). Zur Epidemiologie der Malaria. [**Epidemiology of Malaria.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. Oct. Vol. 37. No. 10. pp. 438-446. With 1 fig

The authors consider that the method employed by MISSIROLI and HACKETT at the two experimental malaria stations, Posada and Torpe, in Sardinia for the estimation of the amount of malaria is the best. In these places the amount of malaria was estimated not in the usual way by spleen and parasite indices of the population, but by the examination of the blood of newly-born infants, who were systematically examined from birth onwards. In Posada and Torpe it was found that practically 100 per cent of the newly-born children became infected. In the author's opinion the spleen and parasite indices are far behind the "New-born Index" in accuracy. The latter index is of special importance in estimating the value of antimalarial measures; only when the frequency of infection in the new-born drops can one speak of the success of the campaign.

E. D. W. Greig.

LUTRARIO (A.). Paralyse générale et paludisme. [**General Paralysis and Malaria.**—*Bull. Office Internat. d'Hyg. Publique.* 1933. Oct. Vol. 25. No. 10. pp. 1769-1771.

Several studies have been made to determine if general paralysis is rare in areas where malaria is prevalent. The author gives a table from the Italian official returns of 1928, showing the deaths per 100,000 from general paralysis and from malaria in 19 areas. He points out that in those places where there are many deaths from malaria, there are few deaths from G.P.I.

W. F.

BROWN (J. Youngson). The Care, Inspection and Transportation of Live Anopheles for Use in the Malaria Therapy of General Paralysis.—*West African Med. J.* 1933 July. Vol. 7. No. 1. pp. 78-81. With 1 fig.

The induction of hibernation by cold storage before shipment of Anopheles is sometimes successful. Moulds are a danger. An instance of prophylaxis with plasmoquine. The difficulty of infecting *A. costalis* with *P. malariae*.

A. costalis was bred from larvae collected locally. The larvae were kept in a basin 18 inches in diameter over which was suspended a bell net of cotton mesh on a wire framework, with a sleeve in the side to admit the arm. The net was removed from the basin every day after the morning catch had been taken, because it was found that no adults hatched out during the day. Several batches of mosquitoes which had been sent to England from Lagos in Barraud's cages, and kept in the ship's hospital during the voyage, failed to arrive in a satisfactory condition; sometimes the cages were covered with moulds and all the mosquitoes were dead. The author considered that they might travel better in the ship's cold room in a state of hibernation. For this purpose, a batch was kept in a refrigerator at 15°C. for about a month before dispatch to England, and the results were rather better, for a few were alive on arrival. The author took 3,000 uninfected and 80 infected *A. costalis* with him when he went on leave to England. The cages were kept in the ship's thawing-out room at a temperature of about 69°F., but about a week later they were removed to the cabin

where the temperature had fallen to about this level, because some of the cages had become mouldy. By the fourteenth day, many of the insects had died, and the author heroically decided to feed on himself those which remained alive. By this means, he was able to deliver alive at Horton, 8 infected and some 700 uninfected mosquitoes. The mosquitoes, being engorged with blood, refused to feed; consequently the infected insects were dissected and the sporozoites from their glands were inoculated into a couple of patients, both of whom developed subtertian malaria. The author took 0.06 gram of plasmoquine daily, beginning on the day before the mosquitoes fed and continuing until twelve days afterwards. He had no malaria until fourteen months later when he had been exposed to fresh infection in Nigeria. (See TRINIDAD above.)

About 20 per cent. of the malaria infections of children in Lagos are due to *P. malariae*, and *A. costalis* is the only carrier, yet not one of 92 mosquitoes belonging to this species became infected through repeated feeding on three quartan gametocyte carriers. W. F.

MACDOUALL (J. C. S.) [Contributed by] **Original Report of the Malaria Expedition to Sierra Leone in 1899**—*West African Med. J.* 1933. July. Vol. 7. No. 1. pp. 85-89.

A reproduction of the original report on Freetown by ROSS, ANNETT, AUSTEN & FIELDING-OULD with remarks thereon by PROUT. It is an interesting and instructive document and shows that all the essentials of malaria prophylaxes were known 34 years ago. It seems probable that if the term "gnat-fever" employed by the authors had come into use the mosquito transmission of malaria would have had a quicker passage to general recognition. The practice of reprinting papers of this kind is to be commended. A. G. B.

BUROWA (L.). Das Knochenmarksbild bei der Malaria. [**Bone Marrow in Malaria.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. Sept. Vol. 37. No. 9. pp. 408-413.

The author investigated 26 cases of malaria, including all three types of parasite; in some chronic cases the parasite was not found. To study the parasitological changes in the marrow he carried out sternal puncture by the method of Arinken. As a result of his investigations he reaches the following conclusions:—The parasitological picture of the marrow in malaria shows no quantitative difference from that of the peripheral blood, hence sternal puncture is not indicated as a diagnostic procedure in malaria. In pernicious malaria all stages of schizogony and formation of young gametocytes are seen in the marrow. He observed in the marrow, in various stages of development, a myeloid and mixed (normo-megalo-proerythroblastic) reaction, at times very marked, at others scarcely noticeable. The leucopenia of malaria cannot be explained by a reduction of leucocyte production, as the marrow shows a very marked myeloid reaction. Eosinophilia was often noted in the marrow and he considers it a favourable prognostic sign. E. D. W. Greig.

MORROW (T. L.) & WIEAND (W. G.). **Atebrine in the Treatment of Malaria. A Report of 53 Cases.**—*U. S. Nav. Med. Bull.* 1933. Oct. Vol. 31. No. 4. pp. 359-363.

Plasmoquine given with atebrin is more toxic than plasmoquine given alone.

Thirty patients with benign tertian and 23 with subtertian were given $1\frac{1}{2}$ grams (0.1 gram) of atebtrin three times a day for 5 days. The subtertian patients were given $\frac{1}{2}$ grain (0.01 gram) of plasmoquine twice a day in addition. The patients were men of the United States Navy in Nicaragua. The blood smears usually became negative after $2\frac{1}{2}$ days treatment and no recurrences occurred, but the dispersion of the men on leaving Nicaragua made it impossible to follow up more than 20 per cent. for as long as two months. Three cases were looked upon as failures because the symptoms persisted longer than 5 days although the parasites had disappeared, and consequently quinine was given which brought down the temperature. Skin discolouration occurred in 10 per cent., it appeared on about the 5th day, and lasted 4 to 10 days. In four of the cases taking plasmoquine and atebtrin, abdominal pain occurred which disappeared when the plasmoquine was stopped. The same thing occurred in several additional cases, not included in this series, when these two drugs were given in combination. Small doses of plasmoquine (0.01 gram, twice a day for 5 days) are not toxic when given alone. Atebtrin appears to enhance the toxicity of plasmoquine.

W. F.

VALCKE (G.) & BOURGUIGNON (G. C.). Etude thérapeutique et clinique de l'association atebtrine-plasmoquine dans le paludisme tropical. [Atebtrin combined with Plasmoquine in Tropical Malaria.]—*Ann. Soc. Belge de Méd. Trop.* 1933. Oct. 30. Vol. 13 No. 3. pp. 331-344.

Patients were alarmed by the toxic effects of atebtrin-plasmoquine treatment

The treatment was carried out on Europeans at Elizabethville where everyone suffers from subtertian malaria sooner or later, whether he takes prophylactic quinine or not. The drugs were given in the proportions recommended by the makers: 0.3 gram of atebtrin and 0.03 gram plasmoquine daily for 5 days, with smaller doses for children. "A radical, immediate and lasting" cure was obtained in 29 out of 32 cases, but in 18 cases there were toxic symptoms. These were mostly mild, but in some cases there were severe abdominal pains and colic lasting a week or so. Those who had been poisoned told their friends, and towards the end of this short experiment the authors noticed a growing repugnance to treatment with these drugs among the public of Elizabethville

W. F.

ECKHARDT (A. E.). Beitrag zur Vertraglichkeit parenteraler Atebtrin-Plasmochin-Behandlung bei Malaria. [Parenteral Administration of Atebtrin and Plasmoquine in Malaria.]—*Arch. f. Schiffs- u. Trop-Hyg.* 1933. Nov. Vol. 37. No. 11. pp. 475-479.

Atebtrin given intravenously and atebtrin-plasmoquine intramuscularly.

The author, working in Tanganyika Territory, gave atebtrin intravenously to several cases of malaria and found that it was well tolerated in doses not exceeding 0.2 gm. He considers that 0.3 gm., the dose recommended by the Malaria Commission of the League of Nations, is too high and may lead to very unpleasant symptoms. The parasitological effect and the rapid and certain clinical action of intravenous injections of atebtrin, even in comatose cases, were very satisfactory. He is not able to draw final conclusions as the number of cases treated

was too small. In addition to giving atebirin intravenously he administered atebirin and plasmoquine intramuscularly. He treated 25 adults by this method. The cases were chiefly malignant tertian. He had very good results even in the most severe cases. Varying with age, the patients received from 0.1–0.3 gm atebirin in combination with 0.01–0.03 gm. plasmoquine by intramuscular injection. Three of the patients had suffered from blackwater fever previously, and one was nine months pregnant; in the latter the drugs had no action on the uterus or foetus. He considers that the advantage of the combined intramuscular injection is that the daily dose is given only once and is followed by rapid and certain action not inferior to that following intravenous injection.

E. D. W. Greig

MAYER (Martin). Ueber intravenöse Atebrinbehandlung der Malaria. [Treatment of Malaria by Intravenous Injection of Atebrin.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. Nov. Vol. 37. No. 11. pp 479–484. With 6 figs

Atebrin, 1 gm. dissolved in 1 cc. distilled water, was put up in ampoules ready for use. Before use 1 cc. was diluted with 3 cc. distilled water. By intravenous injection the author treated successfully and without any unpleasant symptoms 7 cases of malaria. He used up to 0.3 gm. atebirin in 9 cc. distilled water on three successive days. In comatose malarial cases it is not advisable to exceed 0.2 gm. at one injection

E. D. W. Greig.

NEZIC (Eugen). Atebrin, das neue Antimalarikum. [Atebrin in Malaria.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. Sept. Vol. 37 No. 9. pp. 423–427.

The author commenced his observations at the end of June 1932 and treated 79 cases of malaria with atebirin and plasmoquine simplex with good results. The drugs were given in the usual doses for adults and children. No serious toxic effects were noted, a few cases had the well known yellow discolouration of the skin, three of his patients complained of gastralgia. He considers that the number of cases treated is insufficient for a definite opinion on its merits but even now he can state that atebirin is the best antimalarial drug.

E. D. W. Greig.

SOESILO (R.). De beteekenis van chinine en enkele andere geneesmiddelen voor de gezondmaking van- en de individueele prophylaxis in- chronisch-endemische malariagebieden in den Oost-Indischen Archipel. [The Importance of Quinine and Other Drugs Curatively and Prophylactically in Chronically Endemic Malarial Regions.]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1933. Aug. 1. Vol. 73. No. 16. pp. 962–975.

Much that is contained in this article represents a careful assembly and critical discussion of the published facts relating to the use of quinine, plasmoquine and atebirin. They could not well be summarized. Trials made with atebirin, forming personal experience of the author, are specially interesting. Control persons received no atebirin while the test individuals were treated 24 hours or about 5 hours before mosquito infection and 4 to 6 days after with atebirin. The average weight of these volunteers was 51 kgm. and the maximum dose of atebirin given was 200 mgm. daily. Out of 21 who received

treatment with atebtrin 6 succumbed to malaria whereas 10 out of 11 untreated persons contracted the disease. At present an active endeavour is being made to work out a satisfactory routine method of prophylactic administration of atebtrin. *W. F. Harvey.*

JAMES (S. P.). **Antimalarial Chemotherapeutic Tests at the Devon Mental Hospital.**—*Jl Trop. Med & Hyg.* 1933 Oct. 2. Vol 36 No. 19. pp. 289-291

Concerns the prophylactic action of atebtrin.

Five patients at the Devon Mental Hospital were given prophylactic quinine, five were given a new synthetic preparation called phenoquine, five were given atebtrin, and two controls were given nothing. The prophylactic doses were given about 4 hours before the patients were bitten by mosquitoes infected with the Madagascar strain of benign tertian, and they were continued for five subsequent days. The controls, the patients who were given quinine, and those who were given phenoquine all went down with malaria within a fortnight, but none of the atebtrin group showed signs of the disease within the 30 days of observation. *W. F.*

- i. HECHT (Gerhard). **Pharmakologisches ueber Atebrin.** [**Pharmacological Notes about Atebrin.**].—*Arch f. Experim Path. u. Pharm.* 1933. Apr. 24. Vol. 170. No 2/3 pp 328-338. With 2 figs. [13 refs]
- ii. TROPP (C.) & WEISE (W.) **Untersuchungen ueber die Ausscheidung von Atebrin durch Harn und Fäzes.** [**Its Excretion in the Urine and Faeces.**].—*Ibid.* pp. 339-346. With 4 figs
 - i. An account of atebtrin and of its action in malaria appeared in this *Bulletin* (Vol. 29, p. 705 *et seq.*; Vol. 30, p. 198)

It is a derivative of akridin, a bright yellow powder, soluble in water. By ultra violet light it is stimulated to lively fluorescence which is visible in watery solution at 1 : 5,000,000. The effect of poisonous and tolerated doses was studied by oral and intravenous administration in rabbits and in cats. The action of the drug is described on the tissues, the blood, body temperature, circulation and respiration, gut and uterus, reticulo-endothelium. The distribution and excretion are shown in a table, whereby it is seen that in mice killed on the 5th day after an injection the fluorescence test still shows atebtrin at the site of the injection, gall bladder and gut. The conclusion is that from the pharmacological standpoint atebtrin is to be regarded as a substance with weak and uncharacteristic poisonous action. It causes on the one hand a local stimulation of tissue which in higher doses leads to gastro-intestinal symptoms, and on the other hand affects the central nervous system and especially the cerebrum which is stimulated by fatal doses. In intravenous injections it occasions short falls of blood pressure; the heart itself is very resistant. Autonomously innervated organs respond hardly at all to atebtrin. It is excreted very slowly; even after 5-6 days traces of it may be demonstrated by the fluorescence test. The excreta contain only small quantities. Atebrin is subject to an internal circulation: a part is excreted by the liver in the bile and is reabsorbed by the bowel.

- ii. One of the authors has shown at the Hamburg Tropical Institute that atebtrin can be found in the urine of malarial patients three weeks after the last dose. They describe here the colorimetric methods used for its recovery from the excreta. In four cases investigated they

found in the urine 2-3 mgm. 6 days after the last 0.3 gm. dose. The excretion in the faeces was of the same order. For one patient who had received 2.1 gm. of atebtrin, it is computed that in a period of 18 days 0.3 gm. was recoverable from the excreta, *i.e.*, about a seventh part. The physical and biological behaviour (in malarial birds) of the excreted substance permits of the conclusion that it is identical with atebtrin.

A. G. B.

CHOPRA (R. N.) & GUPTA (B. M. Das). **Studies on the Action of Atebrin in Plasmodium Infection of Monkeys.**—*Indian Med. Gaz.* 1933. Sept. Vol. 68. No. 9. pp. 493-499

Atebrin controls the invariably fatal infection of *M. mulatta* with *P. knowlesi*, better than quinine. It does not prevent relapses, but it easily controls them.

NAPIER and CAMPBELL (this *Bulletin*, Vol. 29, p. 700) studied a malaria parasite, *Plasmodium knowlesi*, in the blood of a Malayan monkey, *Macaca irus*. The parasite had little effect upon this monkey, but when it was injected into the common monkey of Bengal, *Macaca mulatta*, an intense infection resulted; as many as 60 per cent. of the red cells became infected, and death, sometimes accompanied by haemoglobinuria, occurred in six or seven days. KNOWLES and Das Gupta (*loc. cit.*, p. 701) succeeded in transferring the infection from *M. mulatta* to man, and from man back again to the monkey. The present authors infected twelve *M. mulatta* by blood inoculation, and treated them with atebtrin when the parasites had become numerous; 0.025 gram were given daily for 3 or 4 days, either intravenously or intramuscularly. Two doses of 0.025 gram were usually sufficient to control the infection, and all phases of the parasite disappeared from the blood. "Intravenous injections of quinine are not effective against a heavy infection, unless they are repeated at short intervals of 3 or 4 hours, but one injection of atebtrin suffices." Atebrin does not prevent recrudescences; even after five days' treatment with large doses the parasites invariably reappeared in 10 to 15 days and they showed as great a virulence as in the primary infection, causing death in a few days. The recrudescence could, however, be more easily checked than the original attack; usually, a single dose was followed by the disappearance of the parasites or their reduction to a chronic scanty infection. Whether they regain their virulence in course of time is not yet known. A monkey of 5 kgm. body weight can stand a dose of 0.025 to 0.05 gram of atebtrin daily by the intramuscular route, or up to 0.025 gram intravenously. Two monkeys, which were given 0.05 gram intravenously died in a few hours. One monkey which was being treated with 0.05 gram intramuscularly suffered from diarrhoea which ceased when the drug was stopped. [Considerable confusion is being caused by the use of different names for the same species of monkey.] W. F.

ROW (R.), DALAL (N. P.) & GOLLERKERI (G. V.). **On the Effects of Quinine, Atebrin and Plasmoquin on Experimentally-Induced Malaria in the Macacus Monkey and on Some of the Pathological Changes observed.**—*Indian J. Med. Res.* 1933. Oct. Vol. 21. No. 2. pp. 295-298. With 13 figs. on 4 plates.

Macacus monkeys infected with the simian parasite *P. knowlesi* die 3 or 4 days after the appearance of parasites, unless they receive specific

treatment while the proportion of infected corpuscles is well below 40 per cent. A dose of $2\frac{1}{2}$ grains of quinine checks the infection, but a few parasites remain, and a recrudescence occurs in a few days which is fatal unless treated. Eventually, by means of repeated treatment, a state of equilibrium or of chronic infection is produced. If 0.025 gram of atebuin is given daily, the parasites disappear much more speedily and none can be seen after 2 days, but recrudescences occur about 10 days after the conclusion of treatment which are fatal unless it is begun again. Plasmoquine acts slowly, like quinine, and, even after long courses, recrudescences occur 10 days after stopping treatment. The state of equilibrium is brought about by fewer doses of quinine than of either of the other drugs.

W. F.

CHOPRA (R. N.), MUKHERJEE (B.) & CAMPBELL (H. G. M.). **The Pharmacological Action and Anti-Malarial Properties of Anhydrocotarnine-Resorcinol-Hydrochloride (a Derivative of Narcotine).**—*Indian Jl. Med. Res.* 1933. Oct Vol. 21. No 2. pp. 255–260.

This derivative of narcotine has no curative action in monkey malaria.

It was stated before the Opium Commission, in 1895, that opium had antimalarial properties. Sir William ROBERTS "suggested that of the two abundant alkaloids of opium, morphia represented the anodyne and hypnotic properties of the drug, and narcotine was the bitter crystalline alkaloid resembling quinine and like that substance possessed tonic and antiperiodic properties." Chopra and KNOWLES (this *Bulletin*, Vol. 28, p. 137) found that narcotine had no action in malaria; it has been suggested, however, that some derivatives of narcotine might have an anti-malarial action. Anhydrocotarnine-resorcinol compound was prepared from narcotine, and tried in monkey malaria. It had no effect upon the parasites or the symptoms.*

W. F.

SCHWETZ (J.), BAUMANN (H.) & PEEL. Sur un essai de quininisation chez des nourrissons noirs. [An Attempt to quininize Negro Babies.]—*Ann. Soc. Belge de Méd. Trop.* 1933. Oct. 30. Vol 13. No. 3. pp. 321–329.

This attempt proved impracticable.

The authors found that 85 per cent. of the infants brought to the clinic at Stanleyville had parasites in their blood, and 50 per cent. had gametocytes. About 12 per cent. were infected with *P. vivax*, which is very rare in adults. It was difficult to get the mothers to bring the babies to the clinic regularly, but most of the infants received a small dose of "quinine" twice a week for 6 weeks. This reduced the number of benign tertian and quartan parasites, but as the crescents were unaffected the authors did not consider it worth while continuing the treatment.

W. F.

*Though, as the above shows, this derivative of narcotine has no anti-malaria properties, it may be worth recalling that the 1895 Commission found that malaria was less prevalent among opium eaters; also, opium was in common use in the Fens up to comparatively recent times "to ward off ague." It is unlikely that a custom of such long duration should have no foundation in fact.—Ed.

GIEMSA (G.) & OESTERLIN (M.) Chemotherapeutische Studien auf dem Gebiete der Chinaalkaloide. [**Chemotherapeutic Researches on Cinchona Alkaloids.**—*Beihefte z Arch f. Schiffs- u Trop-Hyg.* 1933. Vol 37 No. 4 pp. 217-244 (5-32). With 1 fig. [42 refs.]

The results obtained from a chemical and therapeutic research carried on over a period of two years with two main objectives in view, to increase the antimalarial action of the alkaloids and to reduce the toxic effects.

Part I of the monograph deals with the chemotherapeutic investigations, and in Part 2 the results of the chemical researches are recorded.

In the chemotherapeutic investigations the authors worked with bird malaria (*Plasmodium praecox*) using the standard technique of ROEHL, except that 0.5 cc. instead of 1 cc. was administered as they found the birds frequently regurgitated the larger amount. In recording the efficiency of the substances tested the terms "range of action" or "strength of action" were employed. "Range of action" means the ratio of the smallest therapeutically active dose to the maximum tolerated dose, in quinine it is 1:4. The "strength of action" of the substance is determined by giving the substance to the bird during the incubation period, and, if effective, the parasites do not appear in the blood on the 6th to the 7th day after injection as in controls, but later, and the duration of this delay increases with the antimalarial activity of the drug. The results of the investigations are set forth in a table which shows that 70 substances were studied in detail. They found one substance particularly active as an anti-malarial agent, C.77 (6-Methoxychinolin-8-azo-hydrocuprein). It had a "range of action" of 1:8.

The chemical portion of this valuable monograph is of highly technical character and should be consulted in original by those interested.

E. D. W. Greig.

TAREJEW (E.), EPSTEIN (H.), GANTAEVA (A.), RASKIN & BOLOTINA (A.). Essais thérapeutiques du plasmocide, dérivé synthétique de la quinoïdine, dans le paludisme. [**Plasmocide, a Synthetic Derivative of Quinolone in Malaria.**—*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. pp. 1037-1046. With 1 fig.

This drug resembles plasmoquine in many respects.

Dr O. MAGUIDSON and his colleagues at the Institute of Experimental Chemistry and Pharmacology have synthesized a number of anti-malarial drugs, which have been tested on birds by Professor I. KRITCHEVSKY. Therapeutic tests of seven of them have been made by the authors, and they have named the one which gave the most satisfactory results "Plasmocide" or "Antimalarine B." It is methyl-bis-salicylate of 6-methoxy-8-(N-diethyl-amino-propyl-amino) quinoline; a yellowish-brown powder insoluble in water. It is given in tablets containing 0.03 gram, which represents 0.01 gram of the pure base. The daily dose is 5 tablets a day, one every 4 hours. A course consists of 3 days' medication, followed by 4 days rest, continued for 4 to 6 weeks. In quarten, the drug acted very well and no relapses occurred during the course of treatment. In benign tertian, it proved less potent; 20 per cent. relapsed while treatment was being continued, and in most of these cases it was necessary to give quinine. In malignant tertian, the

action was like that of plasmoquine, it destroyed the gametocytes but had very little action on the schizonts; 83 per cent. relapsed during treatment, and 33.3 per cent. after it, for the treatment of this infection it is essential to give quinine with the plasmocide. The authors state in their "conclusions" that the patients showed no signs of intolerance, but, in the report itself, 6.38 per cent. are said to have shown slight toxic symptoms, chiefly epigastric pain, and in one case it was necessary to give morphine.

W. F.

BOVET (D) & DEMANCHE (L.) Nouveaux produits actifs dans le paludisme aviaire: une quinoléine de synthèse agissant sur les schizontes et sur les gamètes (F. 852). [**New Synthetic Active Products in Bird-Malaria, No. 852.**—*Ann. Inst. Pasteur.* 1933. Oct. Vol. 51. No. 4. pp. 528-534.

The synthetic drug No. 852, also a derivative of quinoline, acts on both schizonts and gametocytes. Drugs like quinine and atebirin which are active in bird-malaria due to *P. relictum* are also active against the schizonts of human malaria; drugs like plasmoquine which are active in the malaria of rice-birds due to *Haemoproteus paddae* are active against the gametocytes of human malaria. In the course of their researches into the higher homologues of plasmoquine, the authors have found that if the diamine chain attached to the methoxyquinoline nucleus is lengthened, the gametocidal action is weakened while the schizontocidal action is strengthened. Proceeding on these lines, they have prepared 8-diethylamino-undecylamino-6-methoxyquinoline, or No. 852 F. This product not only acts as powerfully as atebirin on the malaria of canaries, but it also acts on the malaria of paddy-birds though not as powerfully as plasmoquine. The authors concluded therefore that it would have an action upon all forms of human malaria parasites, including gametocytes, and this has been borne out by chemical trials. It is less toxic than plasmoquine.

W. F.

KIKUTH (W.) & GIOVANNOLA (A.). Zur Frage der medikamentösen Malariaphylaxe auf Grund von experimentellen Untersuchungen an der Vogelmalaria. (**The Antimalarial Medical Prophylaxis according to Experimental Researches on Bird Malaria.**)—*Riv. di Malariaologia.* 1933. July-Aug. Vol. 12. No. 4. pp. 657-674. [28 refs.] English summary (8 lines) p. 836.

In their experimental investigations the authors employed a special technique. They did not allow the mosquitoes (*Culex pipiens*), infected with two varieties of *Proteosoma* (*P. cathemerium* and *P. praecox*) to bite the canaries, as the results were very irregular in this method, but they dissected out the infected salivary glands and injected the sporozoites into the birds; in this way they got 100 per cent. infection with *P. cathemerium*. The drugs were administered *per os* through a tube in accordance with the technique of ROEHL. As a result of their researches the authors conclude that:—Neither quinine nor the two synthetic antimalaria drugs, plasmoquine and atebirin, can destroy in the tissues of the birds the sporozoites of *P. cathemerium* and *P. praecox*. None of these drugs can be regarded as causal prophylactics of malaria. Atebrin appears to have a "clinical" prophylactic action, which must be regarded as a therapeutic effect, because it develops during the slow excretion of this drug.

E. D. W. Greig.

CHOPRA (R. N.), GUPTA (J. C.) & GANGULI (S. K.) **The Action of Some Synthetic Antimalarial Remedies on the Uterus.**—*Indian Med. Gaz.* 1933. Oct Vol 68. No 10. pp. 558–561.

Malarcan and tebetren exert an oxytocic action, plasmoquine and atebryn do not.

The authors reached the following conclusions as the result of experiments on cats, rabbits and guinea-pigs :—The pregnant uterus is more susceptible than the non-pregnant to the action of anti-malarial drugs Plasmoquine and atebryn in therapeutic doses are unlikely to exert an oxytocic action on the pregnant human uterus. Malarcan and tebetren may produce increased contractions in doses not very much larger than therapeutic doses. Large therapeutic doses of quinine are likely to increase the contractions of the pregnant uterus, and therefore, in pregnancy, small doses of about 5 grains every 5 hours should be prescribed.

W. F.

FAIRLEY (N Hamilton) & BROMFIELD (R. J.). **Laboratory Studies in Malaria and Blackwater Fever. Part I. Malaria.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933 Nov. 30. Vol. 27. No. 3. pp 289–314. With 5 graphs. [34 refs]

There is no haemoglobinaemia or acidosis in malaria. The direct van den Bergh is negative; the indirect shows hyperbilirubinaemia. Blood urea rises during fever, cholesterol declines. The anaemia is not megalocytic. The reticulocytes increase when the parasites are destroyed by drugs.

The authors conclude that there is no valid evidence of the occurrence of haemoglobinaemia in malaria. The appearance of stained films suggests that much of the haemoglobin is destroyed before the corpuscle ruptures during schizogony, and that damaged, parasitized cells are engulfed whole by the reticulo-endothelial system. A modification of Bloem's method was employed for the study of this question. The limit of sensitivity for the spectroscopic detection of haemoglobin in plasma was found to be 0.33 per cent., and the limit for methaemoglobin 0.665 per cent. For purposes of estimating haemoglobin in an unknown plasma, this was diluted until the alpha band in the spectrum just disappeared, and the degree of dilution was then multiplied by the standard figure of 0.33. In 28 cases of malaria with parasites in the blood, there was no haemoglobinaemia in 16, and only a trace in the remaining 12. In 53 controls there was none in 46, but there was a trace in 7, and the authors decided that the plasma haemoglobin must exceed 0.12 per cent. before it is significant of haemoglobinaemia in malaria.

The bilirubin content of the plasma was investigated in 30 M.T. and 20 B.T. cases by the van den Bergh test, with the result that neither immediate direct nor biphasic reactions were observed; but as regards the indirect reaction this showed an increase above the normal limit of one unit of bilirubin in 19 of the 30 M.T. cases and in 13 of the 20 B.T. cases. This hyperbilirubinaemia may result from the disintegration of haemoglobin anywhere in the body—e.g., phagocytosis in the reticulo-endothelial system—and does not necessarily indicate intravascular haemolysis, as some workers have thought. The hyperbilirubinaemia disappeared rapidly when specific antimalaria remedies were given.

SINTON and BAILEY reported that a condition of acidosis or lowering of the alkali reserve occurred in malaria. The authors examined 16

M.T. cases and 7 B.T. cases by van Slyke's method, with the result that they found no lowering of the CO_2 combining value of the plasma, except to a slight extent in two cases where it had been caused by vomiting. They therefore conclude that there is no acidosis in malaria, so far as decrease in the alkali reserve is concerned.

During the actual fever there is a rise in the blood-urea which is due to blood destruction and the accelerated katabolism associated with fever. In experimentally infected cases of malaria, the blood cholesterol declined when the parasites appeared, and increased steadily when they disappeared as the result of specific treatment. This is interesting because hypocholesteremia is characteristic of pernicious anaemia, here, the cholesterol rises with specific liver treatment and the reticulocyte response which accompanies it.

On haematological grounds, there is good reason for doubting if uncomplicated malaria ever produces a true megalocytic anaemia like that of pernicious anaemia. In malaria, megalocytes are rare, the colour index is normal or reduced, and the average diameter of the corpuscle is not increased; if pernicious anaemia is suspected, the question can best be answered by a Price-Jones curve.

The authors studied the reticulocytes in unfixed blood stained with brilliant cresyl blue. The reticulocytes are identical with the polychromatic erythrocytes of Leishman-stained films. They are immature blood cells whose numbers indicate the activity of the bone marrow. Their normal number varies from 0.2 to 2 per cent., in the cases of malaria with parasites in the blood which were investigated by the authors, they were from 0.6 to 10.9 per cent. Blood destruction in malaria is followed by compensatory hypertrophy of the red marrow which may replace the yellow marrow of the long bones; it is normoblastic in type, and thus differs from the megaloblastic degeneration of pernicious anaemia. From this red marrow the reticulocytes arise, and, following the destruction of malaria parasites by specific drugs, they swarm into the blood, and rise from the normal, up to 20 per cent or more. The lower the blood count, the larger will be the area of erythroblastic tissue laid down, and the greater will be the reticulocyte response when once the parasites have ceased to exert their inhibitory influence on haematopoiesis. Increased blood production follows the destruction of the parasites, and proceeds quite independently of the administration of haematinics such as iron. W. F.

MACHWILADZE (Niko) & KURPANOVA (M.). Ueber die diagnostische Bedeutung der Zunahme der Zahl der Retikulozyten bei Verordnung von Chinin ex juvantibus bei Malaria. [**Diagnostic Significance of Increase of Reticulocytes in Malaria after Quinine Administration.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. Nov. Vol. 37. No. 11. pp. 499-504. With 1 fig.]

The enumeration of reticulocytes may be of assistance in the diagnosis of latent malaria.

The reticulocytes in cases of malaria were counted in the usual way in preparations stained with cresyl blue. The enumerations were done in the morning, twice, before the quinine administration, which was given intramuscularly twice daily in doses of 0.5 gm. for 7 to 8 days. The reticulocytes were enumerated daily. The authors conclude from their observations that:—In all forms of malaria with parasites in the blood an increase of the number of reticulocytes follows the administration of

quinine, the peak being reached about the 4th to the 5th day. In no other disease or anaemic condition did they observe an analogous action of quinine. Hence they conclude that the increase of the reticulocytes after quinine administration is specific for malaria. Consequently, the enumeration of reticulocytes may be of great help in the diagnosis of latent cases of malaria, particularly those without parasites in the blood, for this purpose the enumeration of the reticulocytes should be made before the administration of quinine, and again 4 to 5 days after the administration.

E. D. W. Greig.

STRICKLAND (C.) & ROY (D. N.) **Malarial Infection of the Gut of *Anopheles stephensi* in Calcutta.**—*Riv. di Malariaologia* 1933. Jan–Feb Vol 12 No 1 pp. 57–69. With 6 figs on 3 plates & 1 chart.

The authors believe that the "chitin bodies" of Brug are due to the deposition of chitin in zygotes and sporozoites which have died during their development within the mosquito. This chitinization is not an encystment to protect the living parasite from the host, but rather to protect the host from the dead parasite [The numbers under some of the microphotographs have been accidentally transposed.] W. F.

JOUKOFF (N. M.) & KRASSIKOVA (V.). L'action du plasmocide sur l'inféctibilité de l'*Anopheles maculipennis* pour le *Plasmodium vivax* et *P. falciparum*. [Action of Plasmocide on Infectibility of *A. maculipennis*.]—*Mé. Parasit. & Parasitic Dis.* Moscow. 1933. Vol. 2. No. 1–2. pp. 65–72. [In Russian. French summary p 72]

The authors describe experiments on the prophylactic value of a new synthetic antimalarial preparation, "plasmocide" or "antimalarin," produced in Russia [see TAREJEW, above, p. 174].

The blood of cases of benign and malignant tertian malaria was first examined for parasites, batches of "wild" mosquitoes (*Anopheles maculipennis*) were then fed on the patients, and "plasmocide" was administered (6 doses of 0.015 gram: five on one day and one next day, 10 hours after the last dose). Two hours after each dose of the drug blood films were taken and a fresh batch of mosquitoes allowed to feed on each patient. In the experiment with B.T. 6 patients were used. The infection rate of the mosquitoes which was 72.7 per cent. (8 out of 11) before treatment fell to 18.3 (11 out of 60) after the first dose, and to 0 (39 mosquitoes) after the sixth dose. In the case of M.T., in which 7 patients were used, the infection rate in the mosquitoes before treatment was 13.3 per cent. (6 out of 45); after the first dose it fell to 9.3 (5 out of 54), and after the sixth to zero (74 mosquitoes). This reduction of the infection rate in the insect vector was not due to a corresponding decrease in the number of gametocytes in the blood of the patients, which was not affected by the treatment. The main effect of the drug is the inhibition of the development of the parasite in the mosquito. In the infected mosquitoes the number of oocysts and sporozoites is also reduced, as compared to the control series.

C. A. Hoare.

BARRAUD (P. J.) **A Method of making Slide Smears from Female *Anopheles*, for Examination for Sporozoites of Malaria Parasites, and of preserving the Mosquitoes for Reference.**—*Indian Jl Med Res.* 1933 Oct Vol. 21. No 2. pp 451-454. With 2 figs

The author states that the method described combines the advantages of dissection of the salivary glands with those of SERGENT'S method for detecting sporozoites in the body-fluid. The paper is too detailed for summary. W. F.

KRISHNAN (K. V.), SMITH (R. O. A.) & LAL (Chuanji). **Contributions to Protozoal Immunity. Part I. The Effect of Splenectomy on the Course of Malarial Infection in Monkeys.**—*Indian Jl. Med. Res.* 1933 Oct. Vol. 21 No 2. pp 343-352. [13 refs.]

Immunity in malaria is a function of the reticulo-endothelial system, and removal of the spleen renders monkeys of highly tolerant species subject to severe and fatal infection.

The reactions of 14 splenectomized *M. rhesus* monkeys to malaria were compared with those of 27 non-splenectomized monkeys of the same species. Two out of seven non-splenectomized animals recovered without treatment, but all the non-treated splenectomized monkeys died. Treatment with quinine saved 80 per cent of the normal monkeys but only about 10 per cent. of the splenectomized.

Malarial infections (*P. mui*) in normal *M. mus* and *M. radiatus* monkeys are almost symptomless and never fatal, but the inoculation with *Plasmodium mui* of 16 splenectomized monkeys of these species produced an acute fatal illness. Seven out of 10 untreated monkeys died, and also 2 out of 6 which were treated with quinine. The authors consider that immunity in malaria depends upon the functional efficiency of the reticulo-endothelial system. "Removal of the spleen; by interfering with these processes, converts latency into relapse, resistance into susceptibility and recovery into death"

W. F.

CHOPRA (R. N.) & CHAUDHURY (S. G.). **On the Electric Charge of Erythrocytes. Part II. Malaria.**—*Indian Jl. Med. Res.* 1933. Oct. Vol. 21. No. 2. pp. 273-276.

The authors have found that the negative charge of erythrocytes collected from malaria patients and suspended in salt solution, is very variable; in some cases the charge is lower than the normal, in others it is higher. (See this *Bulletin*, Vol. 30, BROWN, p 830.) W. F.

KOCH (Franz) & VOHWINKEL (Karl H.). Ueber die Flockungsreaktion nach Henry bei Impfmalaria (Beitrag ueber die Rezidivgefahr). [**Henry's Flocculation Reaction in Inoculation Malaria. Danger of Transmission from Relapses.**].—*Deut. Med. Woch.* 1933. Dec. 1 Vol. 59. No. 48. pp. 1792-1793.

This investigation on the flocculation reaction was undertaken with reference to the warning recently expressed of the danger of the transmission of inoculation malaria by anopheles and of the relapse.

The authors do not discuss the technique of the reaction in detail, but refer to the paper of KAPPUS [this *Bulletin*, Vol. 30, p. 88]. They

employed as antigen iron albuminate No. 113, Merck. They studied 21 cases of inoculation malaria. All showed a positive reaction from the 7th rigor onwards. Usually the fever was stopped by quinine after the 8th rigor and in 8 to 10 days thereafter the reaction was negative in 100 per cent. of the cases. From their investigations and study of the literature they are of opinion that the undesired transmission of inoculation malaria is not a danger to the community. Cases recorded will not stand close scrutiny and are very unconvincing. They consider that inoculation malaria stands in a special relation to natural infection with benign tertian, because of the former's susceptibility to quinine, the rarity of relapse, and because small doses of quinine rendered a positive flocculation reaction negative in 100 per cent. of cases.

E. D. W. Greig.

CHORINE (V.) & GILLIER (R.). Sur le mécanisme de la réaction de Henry dans l'infection paludéenne. [*The Mechanism of Henry's Reaction.*]
—C. R. Acad. Sci. 1933. Oct. 23 Vol. 197. No. 17. pp. 950-952.

This reaction is governed by: (1) an increase of substances which are soluble in serum, but insoluble in distilled water, (2) the molecular concentration of the blood. It is due to a disturbance in the proportion of these two factors. The authors have already shown that melanin does not possess antigenic properties, and that surflocculence, or flocculation in the tubes without melanin, increases parallel with diagnostic reaction during the course of malaria.

In order to test the hypothesis that the reaction depends upon an increase of globulin, they added globulin to a negative serum and found that it then became positive; when heated for half an hour at 55°C. it became negative again. The reaction appears to depend upon the greater solubility of globulin in serum than in water. Other substances with the same property act in the same way; for example, the addition of lecithin will make a negative serum positive. Such substances are more soluble in salt solution than in water, and the addition of an electrolyte to a slightly positive serum will make it negative; removal of salts by dialysis, on the contrary, will tend to make a negative serum positive. During a malaria paroxysm, the potassium in the blood rises sharply with the destruction of many blood cells, and a positive reaction tends to become negative. The excess of potassium is quickly eliminated at the end of the attack, and the reaction is restored. The melanin appears to react simply as an indicator of the reaction.

W. F.

BADENSKY (A.) & BIVOL (E.). La réaction d'Henry dans le diagnostic du paludisme. [*Henry's Reaction in Diagnosis of Malaria.*]
—C. R. Soc. Biol. 1933. Vol. 114. No. 29. pp. 224-225.

The authors studied the reaction in 95 cases of inoculation malaria. It was negative before the fever began, it was feebly positive during the early paroxysms, it became strongly positive after 7 or 8 had occurred, and it disappeared gradually under the influence of quinine.

W. F.

KRITSCHESKI (I. L.) & DEMIDOWA (L. W.). Das Phänomen der Melanoflocculation bei der experimentellen Vogelmalária. [**Melanoflocculation in Bird Malaria.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1933. Vol. 80. No. 1/2. pp. 135-145.

The authors undertook the investigation to determine whether the reaction of Henry was a true immunity reaction with the formation of antibodies to the pigment, which is more or less related to that of the plasmodium, or whether this reaction was only an alteration of the physico-chemical properties of the human organism under the influence of the parasite, which has not been observed in the true immunological reactions known to us. For their researches they employed three species of birds, namely, *Spinus spinus*, *Acanthis linaria*, and *Serinus canarius*. Two different species of malaria parasite were used, *Plasmodium praecox*, and *Plasmodium cathemerium*. As a result of their studies the authors conclude that the phenomenon of melanoflocculation is a reaction between antigen, the melanine of the retina, and antibodies; the latter are formed in the animal body by the action of the melanine of the malaria parasite.

E. D. W. Greig.

SIOTT (H.). The Mechanism of Immunity in Malaria. Proof of the Phagocytosis of Malarial Parasites by Large Mononuclear Cells in Malaria.—*Indian Med. Gaz.* 1933. Sept. Vol. 68. No. 9. pp. 507-510. With 8 figs.

The author reports two cases in which mononuclear phagocytes containing engulfed parasites were present in the peripheral blood. Both were cases of heavy subtertian infection with numerous sporulating forms in the peripheral circulation. He suggests that phagocytosis normally takes place in the fixed reticulo-endothelial cells which become free in the blood only in the severest infections. [See DE LANGEN, this *Bulletin*, Vol. 29, p. 717, and J. G. THOMSON, Vol. 30, p. 827.] W. F.

KRISHNAN (K. V.), LAL (Chiranji) & NAPIER (L. Everard). **Cytological Studies of the Blood and Tissues in Kala-Azar and Associated Conditions. Part IV. The Large Mononuclear Cells in Monkey Malaria.**—*Indian Med. Gaz.* 1933. Feb. Vol. 68 No. 2. pp. 66-74. With 5 charts & 1 coloured plate.

It is here recorded that observations on monkeys suffering from malaria have shown that each of the three types of mononuclear cell occurring in the blood plays a part in the immunity process. The histiocyte is primarily responsible for the removal of damaged red cells from the peripheral blood. In malarial attacks it is the first cell to be stimulated and becomes more and more numerous during the destruction of red cells. When the infection subsides and becomes latent its numbers fall. In those cases in which the infection gains the upper hand the histiocyte percentage also falls. Following the histiocyte the cell of intermediate type with similar function is stimulated while finally the monocyte count increases. So long as the monocyte count remains high the malarial infection does not get out of hand. It seems probable that this cell has an indirect action associated with some humoral change in the serum which limits multiplication of the parasite in the body.

In a coloured plate are illustrated the various cells of the blood as revealed by the method of supravital staining employed in the investigation. C. M. W.

PANAGIA (Antoaino). Colesterinemia e reazione di Wassermann nella malaria. (**Cholesterinemia and Wassermann Reaction in Malaria.**)—*Riv. di Malarologia* 1933 Sept-Oct Vol 12. No 5. pp 873-881. [37 refs] English summary (10 lines) p 1064

Three interconnected investigations are comprised in this article: (1) the amount of cholesterol in the blood of malaria patients; (2) the W.R. in malaria, and (3) the relation between the amount of cholesterol in the blood and the W.R.

Under normal conditions the amount of cholesterol in blood is taken as between 1.5 and 1.8 gm. per mille. Among 59 patients, the amount was found to be normal in 18, above normal (up to 3.0 per mille) in 20, and below normal (down to 1.1) in 21. There is nothing characteristic, therefore, in this respect [See FAIRLEY and BROMFIELD, above, p. 176.]

As regards the W.R. in these patients, "all clinically free from syphilis," four gave a weak positive, five a marked positive, four others a doubtful reaction, *i.e.*, 4.7 per cent. only were positive.

Lastly, no correlation was made out between the amount of cholesterol in the blood and the W.R. From the detailed protocol it is seen that four patients with cholesterol within the normal limits gave a marked positive, while of five with an increase in cholesterol one gave a weak positive and four a doubtful reaction. H. H. S.

BOYD (George H.). **Host Fatigue and Feeding in their Relation to the Reproductive Activity of *Plasmodium cathemerium* Hartman.**—*Amer. Jl. Hyg.* 1933. Sept. Vol. 18. No. 2. pp. 295-322. With 14 figs

The author's conclusions to these researches on canaries infected with *P. cathemerium*, are as follows:—

"1 Although reversal in the daily cycle of exposure of the host to light and darkness forms a very effective means of reversing the reproductive activity of *P. cathemerium*, these experiments indicate that the light itself is not of primary importance

"2 The results of these studies do not seem to indicate that host fatigue plays any part in determining the definite periodicity which normally characterizes the reproduction of *P. cathemerium*

"3 The taking of water by the host appears to have no effect upon the reproduction of these parasites

"4. The factors associated with host feeding seem to exert considerable influence upon the reproductive activity of this parasite. These factors are difficult to control, and there are probably other factors involved, but these experiments seem to us to indicate that the feeding habits of the host bear an important relation to the definiteness of the periodicity of reproduction which characterizes these parasites." W. F.

MAJID (Syed Abdul) & SINTON (J. A.). **The Longevity of Females of *Culex fatigans* under Experimental Conditions, and the Duration of Malarial Infections in these Insects.**—*Indian Jl. Med. Res.* 1933. Oct. Vol. 21. No. 2. pp. 455-466. [12 refs.]

Half the mosquitoes survived 100 days. One survived 210 days.

Ninety-nine *C. fatigans* were given a blood meal from a sparrow infected with proteosoma; they were then kept in a room with an

average temperature of 62.5°F., and a relative humidity between 60 and 80 within the mosquito-containers. Forty of the mosquitoes survived for 105 days. These forty were then kept at an average temperature of 70.5°F., with a rather lower humidity than before. Five mosquitoes survived until the 189th day, one up to the 196th day and one to the 210th. Active, but apparently non-infective, sporozoites were found as late as 166 days after the infecting feed, and non-motile sporozoites as late as 210 days. At lower temperatures, such as are employed by JAMES, maturation of the parasites is slower and they remain infective for a longer period. *W. F.*

RODENWALDT (Ernst). Kaart en determinatietabel van de larven der anophelinen van Ned. Oost-Indië [**Card and Identification Key of Anopheline Larvae of the Netherlands East Indies.**]—1 folding table & 2 folding plates. 3rd Edition. 1933. Weltevreden. Uitgegeven door den Dienst der Volksgezondheid.

The first edition of this work issued in 1927 (this *Bulletin*, Vol. 25, p. 815) described 16 species; the second, 2½ years later, amplified this but the number described was only seventeen. The present, third, issue is considerably larger and more detailed. The author states in his preface that there have been of late years many new discoveries, especially in the eastern part of the archipelago and that on this account a new edition of his work was needed and not merely because the former was exhausted.

He describes in detail with large and clear illustrations 21 species, including this time rarer forms, because medical men now devote considerable time and care to the study of these larvae and the inclusion of rarer forms will no longer give rise to confusion but will be a welcome aid. For the same reason he considers certain characteristics which, with few exceptions, do not as a rule play a large part in differentiation of species, namely the costal palmate hairs; these, he finds, a valuable group characteristic and serviceable, therefore, when but a few or damaged specimens are available. This is a useful point, he states, in distinguishing the larva of *A. parangensis* from that of *A. ludlowi-subpictus*; again, the larva of *A. merancensis* resembles in all other respects *A. philippinensis* and can only be distinguished by these combs. By this means, too, *A. amictus* has been removed from its former grouping. They differentiate *A. hyrcanus* from all other species of *Myzorrhynchus* and *A. anandalei* and *A. subpictus* in sweet water from the forms found in salt water.

Other distinctive points on which special stress is laid are the "shoulder hairs" and the bosses (wortelknoppen) on which they are inserted.

Finally, as regards the larva described as *probably A. leucosphyrus* var. *hackeri*, this has been described as a separate species in accordance with the opinion of the Antimalaria Service.

The drawings are clear and of such a magnification that the characters are well demonstrated and easily followed, although all the text is Dutch. *H. H. S.*

FOURIE (L.) **Practical Aspects of Malaria Control in the Sugar Belt of Natal.**—*South African Health Officials' Assoc. Rep. Proc. 8th Congress, Pietermaritzburg, 5th, 6th, 7th & 8th June, 1933.* pp 2-10.

This paper describes the creation in June 1932, of an organization, on the lines recommended by Professor SWELLENGREBEL [this *Bulletin*,

Vol 28, p. 981], consisting of 14 local Malaria Committees whose areas of jurisdiction cover the whole of the sugar belt in which malaria has become a grave menace during recent years.

The area involved is nearly a thousand square miles in extent. Four courses, lasting 5 or 6 days each, have been held for training the personnel of the committees in the methods of malaria prevention and about 50 Europeans attended. The area of operations is limited to the breeding places of *A. costalis*, and is restricted to a half-mile radius round human habitations. Oil has entirely superseded Paris green as a larvicide in Natal, but the author thinks that the latter is useful in newly-planted cane fields where oil may injure the crops, and also in native water-holes during dry weather. He recommends that antilarval measures should not be discontinued entirely during the off-season. He emphasizes the importance of checking all work, by searching for adult mosquitoes in houses. The results of the measures adopted are very promising.

W. F

HENRARD (C) & VAN HOOF (L.). Etude de facteurs épidémiologiques au cours d'un essai limité de prophylaxie antipaludique par la quinine et la plasmochine. [Epidemiological Factors in an Attempt at Prophylaxis with Quinine and Plasmoquine.]—*Ann. Soc. Belge de Méd. Trop.* 1933. Oct. 30. Vol. 13. No. 3. pp. 267-284. With 1 plan.

The attempt failed and the failure is attributed to the difficulty of isolating the treated group.

This experiment was made in a somewhat isolated coolie camp on a coffee estate near Léopoldville. Another camp, 800 metres distant, served as a control. A river between the two camps was the breeding-ground of *A. costalis* the carrier. The splenic index was 50, and the parasitic index 62, 13.7 per cent. of 204 *A. costalis* were found to be infected. From the 18th March 1932, each coolie was given 8 grains of quinine and 0.02 gram of plasmoquine daily, and this treatment was continued—except that the quinine was reduced to 4 grains after April 6th—until June 26. The doses were given by an orderly who neglected his duty, but, nevertheless, only 14 per cent. of the coolies had schizonts at the end of the treatment, and gametocytes were found in none. The infectivity rate of anopheles was only 3.2 per cent. as compared with 13.7 at the beginning of the experiment, but the authors ascribe this to the dry season, because the index had sunk to 2.6 in the control camp. Two months after the conclusion of the experiment, the rains came on and the infectivity index of the anopheles in the test camp was as high as it had been before the coolies were treated with plasmoquine. The authors ascribe the failure to the difficulty of isolating the coolies sufficiently to prevent the introduction of infection.

W. F.

BARROWMAN (Barclay). Chemotherapy in Anti-Malarial Sanitation.—*Malayan Med. J.* 1933. Sept. Vol. 8. No. 3. pp. 163-175. With 4 charts.

The author is a firm believer in mosquito control as opposed to drug control. He also considers that the treatment of patients with 30 grains of quinine for 10 days is useless.

He analyses the cost and efficiency of various methods of prophylaxis by drugs as tested on a large area of rubber and coconut estates situated on the west coast of the Malay Peninsula, and he compares the results with those of mosquito control over a half mile radius around habitations. His main conclusion is "that in Malaya, where malaria is potentially hyperendemic throughout the 12 months of the year, no method of chemoprophylaxis at present available . . . can offer itself to any degree, as an alternative to antimosquito measures, for the antimalarial sanitation of a population exceeding 80 persons. Results obtained by chemoprophylaxis in India and Ceylon where there is a definite season in each year when malaria is naturally absent cannot be applied to conditions in Malaya." For very small isolated populations, antimosquito measures are too expensive and drugs may be employed. He is no believer in the ordinary "short quinine" treatment of 30 grains a day for 10 days: it "is useless either as a means of the cure of the individual or as a sanitary measure." He has found a week's treatment with atebirin much more effective and cheaper than three weeks' treatment with quinine and plasmoquine or three months' treatment with quinine alone. "By the universal use of the short treatment with atebirin the malaria incidence on a mosquito-controlled estate would be reduced . . . the malarial incidence in all systems other than those including anti-mosquito measures is so high as to be a strong adverse factor to the commercial working of the estate, quite apart from the fact that the cost of the necessary treatment of the disease is higher than that of the adequate anti-mosquito measures." [See WALLACE, below, and RUSSELL, above, p. 160.] W. F.

WALLACE (R. B.). **Further Field Experiments with Plasmochin in Oiled and Unoled Areas.**—*Malayan Med. J.* 1933. Sept. Vol. 8. No. 3. pp. 145-162. With 6 charts.

The author describes his further attempts to control malaria on a rubber estate by means of plasmoquine and quinine.

The coolies on four divisions were given quinoplasmine, 3 tablets daily for 14 days, just about the time of the greatest prevalence of *A. maculatus*, at the beginning of the malaria season. At the end of the 14 days small doses of plasmoquine were given, and were continued for 5 months, until the end of the malaria season. The doses on the several divisions were respectively: 0.01 gram plasmoquine every third day; 0.02 gram plasmoquine and 4 grains of quinine twice weekly, 0.02 gram plasmoquine daily, 0.02 gram plasmoquine daily. The last division differed from the other three because, on it, all anti-larval measures were suspended. The drugs were administered by the dressers in charge of the divisions. There was a considerable movement of coolies about the estate, and they were frequently transferred from one division to another. On all the treated divisions the malaria rate remained lower than on the control. The daily dose of 0.02 gram on the division where oiling was suspended "appeared to be successful in preventing malaria during the time the drug was given, in spite of the fact that the breeding places of *A. maculatus* . . . were abundant." The cost of treatment in this division was \$1.00 (2s. 4d.) a head per month. The effects of the treatment had vanished two months after it was finished. (See this *Bulletin*, Vol. 28, p. 135.) W. F.

DE MELLO (I. Froilano) **A Scheme for Malarial Sanitation in Rural Areas.**—Reprinted from *Antiseptic* 1933. Sept. 4 pp.

In praise of mass treatment with plasmoquine and quinine.

Codal, an isolated village with 47 inhabitants, had a splenic index of 82.7. A treatment consisting of 0.03 gram of plasmoquine with 0.5 gram of quinine was given to each adult every day for eight days, and smaller doses were given to the children. Three shorter secondary courses with the same doses were given at intervals, and subsequently one day's treatment every week for 2½ months. Any stranger coming into the village from the neighbouring malarious areas received a course of treatment. The killing of adult mosquitoes and the application of Paris green to breeding places was also carried out. The splenic index fell from 82 to 27, and the daily sick rate from 32 to 2. The mass treatment with plasmoquine of all villages having a splenic index of over 50 per cent. has now been made compulsory in Portuguese India. W. F.

BRITISH MEDICAL JOURNAL. 1933. Nov. 18. pp 919-920.—**Mass Treatment with Plasmoquine.**

Two tablets of plasmoquine, given once a week for two weeks, halved the amount of malaria among employees in Trinidad during the two succeeding months.

Dr. Grant R. GRIBBEN treated the employees of the Trinidad Lake Asphalt Operating Co., Ltd., with tablets of plasmoquine containing 0.01 gram of plasmoquine and 0.125 of quinine. The dose given to adults was two tablets once a week for two weeks; the doses for children were in proportion to their ages. The tablets were handed over to the heads of families on pay-day for administration to themselves and their dependents. There are two malaria seasons in Trinidad, the first at the beginning of July, the second at the end of September. In the latter half of September 1932, 6,856 tablets were issued to 2,142 people, but only 1,289 received the complete two weeks' treatment. During the two months which followed, the attendances at the dispensary, on account of malaria, were only about half as many as those of the same months in 1931. In the latter half of June 1933, Dr. GRIBBEN repeated the mass treatment, and in July there were only 66 cases of malaria as compared with 96 cases in July 1932; at the same time, there was an increase of 28 per cent. in the amount of malaria in the surrounding districts.

The world-famous Pitch Lake occupies the centre of a crater-like depression about 110 acres in extent. The surface is fairly hard and can be easily walked over, but a continuous movement goes on, which results in the formation of many wrinkles and folds; these become filled with water, but they are kept clear of larvae by a small fish, *Rivulus hartii* (Cyprinodontidae), which can crawl overland from one pool to another. W. F.

PECORI (G.) & ESCALAR (G.). La lutte contre le paludisme dans la campagne Romaine en 1932. [The Campaign against Malaria in the Roman Campagna in 1932.]—*Bull. Office Internat. d'Hyg. Publique*. 1933. Oct. Vol. 25. No. 10. pp. 1743-1746.

The means employed are: searching out and treating infected persons, antilarval and antimosquito measures, and prophylactic

quinine in those places which are still malarious. The incidence of malaria during 1932 was 2.66 per cent. The primary cases amounted to only 1.2 per cent. The splenic index in 6,508 school children was 6.2 per cent. Benign tertian was three times as common as subtertian. Quartan was very rare. The population of the Campagna, apart from the suburbs of Rome, is now 82,087 W F

GORÉ (Ramkrishna N) **The Feather-Duster Mosquito-Trap. (A Simple Device for catching Mosquitoes in Houses.)**—11 pp With 3 charts. 1933. Bombay: 82 Ghodbunder Road, Khar [4 annas.]

The author describes and figures a simple device for trapping mosquitoes in houses.

It depends on the observation that mosquitoes settle in numbers on feather dusters, such as are sold in the Indian bazaars, and may be trapped by slipping a muslin bag over a duster placed with the handle in an upright bottle. The dusters are disposed about the house in the evening and between 10.0 a.m. and 2.0 p.m. next day the insects are trapped in the muslin bag carefully lowered over duster and bottle (see figure). The bag and handle of the duster



(a) Feather-duster, (b) Bottle, (c) Muslin bag held at the closed end preparatory to lowering it over duster and bottle.

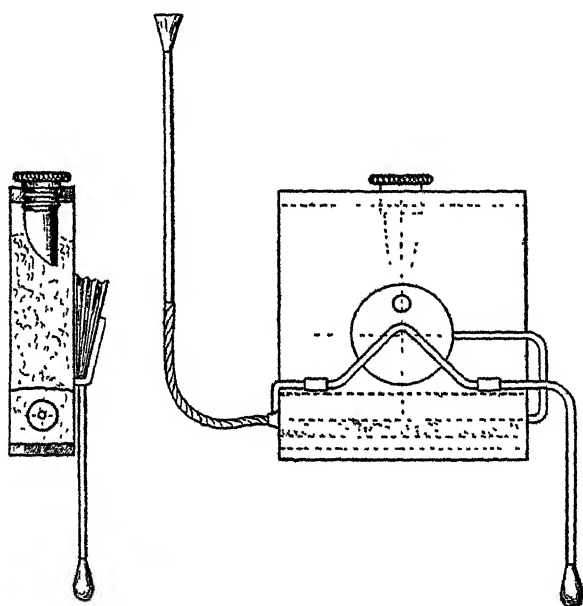
[Reproduced from "The Feather-Duster Mosquito-Trap" (GORÉ)].

are then grasped just above the bottle, from which they are lifted, the bag and duster are inverted and the duster is drawn out in such a way as to leave the insects behind. With some manual dexterity the same bag will collect from a series of dusters. The mosquitoes are then destroyed by heat or exposure to the sun.

The author has used these traps in his house in a suburb of Bombay for 15 months. Six traps daily have in 12 months accounted for 80,795 mosquitoes, the greatest number in one day being 1,015. The monthly counts are shown in a chart. In a later paper he will give details of genus and sex. [Many mosquito traps are described in COVELL'S "Malaria Control by Anti-Mosquito Measures." Nineteen references are given (see this *Bulletin*, Vol. 28, p. 1035).] A. G. B.

DE BENEDETTI (Augusto). Nota su di una modificazione per migliorare il funzionamento ed il rendimento delle macchine soffiatrici usate per lo spandimento del verde di Parigi. (**To improve the Function and Efficiency of Bellows used for the Dispersion of Paris Green.**) —*Riv. di Malariologia*. 1933. Sept.-Oct. Vol. 12. No. 5. pp. 897-900. With 1 fig. English summary (8 lines) p. 1064.

An improvement of the bellows used for the application of Paris green.



Bellows used for dispersion of Paris green, fitted with a punctured diaphragm to regulate the descent of the powder, thus avoiding any blocking of exit cylinder.

[Reproduced from *Rivista di Malariologia*]

"The author has applied to the bellows a punctured diaphragm, which carries the larvicide mixture; thus is avoided the obstruction of the cylinder through which the powder is ejected by the draft caused by the pump. Besides, in the cylinder is a continuous descent of a limited amount of powder so that the dispersion is without interruption or loss. An economy of 50 per cent. is realized in the quantity of the larvicide mixture. The apparatus functions to the maximum with economy of time and labor. This modification is also useful for agricultural purposes."

A. G. B.

TILLI (Pietro). Disanofelizzazione idrica mediante la calciocianamide. (**Larval Control through Calcium Cyanamide.**)—*Riv. di Malarologia*. 1933 July-Aug. Vol. 12. No. 4. pp. 722-730. English summary (5 lines) p. 838.

The author made trial of various chemicals as regards their larvicidal action; he found that the nitrates of ammonium or sodium and the sulphate of ammonium were effective only in a concentration as high as 8 per cent. He then tested calcium cyanamide (nitrolime), first as to its effects on the larvae of mosquitoes either obtained from the canals or bred in the laboratory; second as to its preventive effects, if any, on oviposition, and third, a field test. He found that in strengths of 0.14 to 0.03 per cent. (in different experiments) it had a larvicidal action, that when added to water it did not prevent deposition of ova, but many of them did not develop. In the field the effect depended considerably on the duration of application and was not to be compared with that of mineral oils or Paris green. H. H. S.

BODENHEIMER (F. S.). Die Malaria als ökologisches Problem Studien zur tierischen Bevölkerungslehre I.—*Folia Medicinæ Internæ Orientalia* Jerusalem. 1933 May Vol. 1. No. 2. pp. 135-168. With 10 figs [2 pages of refs.] English summary.

BOYÉ. L'utilisation de l'avion à Madagascar dans la prophylaxie anti-paludique pour l'épandage du "Vert de Paris"—*Bull. Office Internat. d'Hyg. Publique* 1933. Oct Vol 25 No 10 pp 1766-1768

BROWN (J Youngson). African Children in European Reservations as a Reservoir for the Production of Sporozoite Infected Anopheles.—*West African Med. JI* 1933 July Vol. 7. No 1 pp. 81-82.

CHIANG (W. L.) & YANG (C S). Prevalence of Malaria in the Mausolean District in Nanking A Preliminary Survey.—*Chinese Med JI* 1933 July Vol 47 No 7 pp 689-693.

FROES (Hector). Endemiologia e profilaxia da malaria.—Reprinted from *Jl dos Chmicos* 1933 Aug 15 & 30. Nos 15 & 16. 39 pp. With 11 figs

HASSELMANN (C M). Therapeutical Notes on Atebrin, Plasmoquine (Plasmochin) and Yaten; a Critical Evaluation.—Reprinted from *Rev. Filipina de Med. y Farmacia* 1933 Aug Vol 24. No 8 pp. 359-367 [42 refs.]

KRISHNAN (K. V.). Observations on the Mode of Action of Quinine in Malaria.—*Indian Jl Med Res.* 1933. Oct Vol 21 No 2. pp 331-342 [10 refs.]

DE LANGEN (C D). Enkele beschouwingen over de medicamenteuze behandeling en prophylaxe der malaria.—*Geneesk Tijdschr v Nederl-Indië* 1933. Sept. 12. Vol 73. No. 19. pp 1154-1161

LASNET. Organisation et fonctionnement du service antipaludique en Algérie.—*Bull. Office Internat. d'Hyg. Publique*. 1933. Oct. Vol 25 No 10. pp. 1747-1765

LEGA (G) & CASINI (G). L'azione della chinina e della plasmoquina sui gametociti della malaria (The Action of Quinine and Plasmoquine on Malarial Gametocytes).—*Riv. di Malarologia*. 1933. July-Aug Vol 12. No. 4. pp. 701-707 With 2 figs. English summary p 837.

LUCHERINI (Tommaso). Aumento di volume della milza nel periodo preaccessoriale dell'infezione malarica primitiva inoculata a scopo terapeutico (Spleen Increase during the Period preceding the Paroxysm of the Therapeutic Malaria).—*Riv di Malarologia* 1933. July-Aug Vol 12. No. 4. pp 718-721 English summary (4 lines) p. 838

MANCA (Serafino). L'azotemia nella malaria. (Azotemia in Malaria).—*Riv di Malarologia*. 1933. Sept-Oct. Vol 12. No. 5. pp 848-858. [11 refs.] English summary (7 lines) p. 1063.

- MANSON-BAHR (Philip) Malaria and its Effects—Reprinted from *Practitioner* 1933 Aug Vol. 131 pp 124-135 With 3 charts
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HEAT STROKE

MORTON (T. C St C) **The Aetiology and Treatment of Heat Exhaustion and Heat Hyperpyrexia, with Special Reference to Experiences in Iraq.**—*Proc Roy. Soc Med* 1932. June. Vol 25 No. 8 pp 1261–1271 (United Services Sect. pp. 19–29). With 4 figs.

A study of a series of cases of heat exhaustion and heat hyperpyrexia occurring during a severe heat wave, with a discussion on aetiology, clinical symptoms, treatment, and prophylaxis

Twenty-seven cases of heat exhaustion and three of heat hyperpyrexia occurred in Hinaidi where there was a low degree of humidity throughout, but a shade temperature which reached 120° on three days. The main symptoms shown by the cases of heat exhaustion were: vomiting (18); dizziness (13), constipation (11), cramp (6), suppression of urine (4); anidrosis (3). The author considers that there is no hard-and-fast line between severe heat exhaustion and heat hyperpyrexia, for heat exhaustion of the severe acidosis type, if untreated, will pass on to the complete clinical picture of hyperpyrexia. The treatment found effective for heat exhaustion was: (i) Preliminary purgation and treatment for shock; (ii) the administration of the following mixture hourly for 24 hours—glucose, 1 drachm; sod bicarb., 15 grains; water to 1 oz. If not well tolerated, pot. cit., 25 grains was given instead. When neither of these was retained, about 1½ pints of 2 per cent. sod. bicarb. in saline, sometimes combined with 5 per cent. glucose, was given intravenously. The beneficial effect of the intravenous injection is described as dramatic

These intravenous injections gave disappointing results in heat hyperpyrexia, where the indications are to reduce the temperature as effectually as possible. The essential factor was found to be the provision of a specially cooled ward, and a considerable measure of success was achieved. The radiator of a Leyland lorry was kept filled with ice, and the fan-driven air was passed by means of a tunnel into a one-bedded bunk. By this means a constant temperature of 82° was obtained when the general ward temperature rose to 95°.

To prevent the onset of heat hyperpyrexia in fever cases in hospital, the author recommends: (1) Provision of an artificially cooled ward, (2) Potassium citrate lemonade made by adding 10 to 15 grains of pot. cit. to a glass of home-made lemonade. A pint of this to be taken thrice daily. This latter is recommended also as a general prophylactic during a heat wave.

W P. MacArthur.

TALBOTT (John H.) & MICHELSEN (Jost). **Heat Cramps. A Clinical and Chemical Study.**—*Jl. Clin. Investigation*. 1933. May. Vol. 12. No. 3. pp 533–549. With 1 fig. [26 refs.]

This paper is a clinical description of five cases of heat cramp with a discussion of a chemical study of blood and urine. It is argued that the etiological factor is a loss of base, chlorides and water from the body, without adequate replacement.

The authors' chemical observations indicate that the body tissues of patients with heat cramp contain hypotonic fluid, not from excess of water but from depletion of total base and chlorides. In this series of cases, the reduction in serum chlorides varied from 2 per cent. to

10 per cent. below the accepted normal minimal value, and was proportionate to the severity of symptoms. This deficiency was further evidenced by the marked retention of salt by the body early in recovery, and in one patient an intake of 45 grams of sodium chloride in 42 hours was accompanied by a urinary excretion of only 4 grams.

Owing to the loss of salt and water from the body and the concomitant replacement of water only, there is a lowering of the chloride level beyond the normal range. The authors believe that when a critical level for the chlorides is reached in working individuals muscle cramp will occur, and that the critical chloride level is a function of individual susceptibility, acclimatization and the length of the prodromal period.

Intravenous injections of normal saline in 5 per cent. glucose with an exclusive milk diet during the acute stage, were found satisfactory in the treatment of the cases studied.

Heat cramp may be prevented by providing a daily supply of salt greater than that lost in the sweat. This amount may be determined from the appropriate quantity of chloride excreted in a 24-hour urine specimen. The authors consider that less than 3 grams of salt per day in the urine does not provide for a satisfactory margin of safety.

W. P. M.

MILLS (C. A.) & OGLE (Cordelia). **Climatic Basis for Susceptibility to Heat Stroke or Exhaustion.**—*Amer. Jl. Hyg.* 1933. May. Vol. 17. No. 3. pp. 686-696. With 4 maps.

A study of the adaptation of experimental animals to environmental temperature conditions is here compared with a statistical analysis of heat stroke and heat exhaustion as occurring in the United States of America.

The authors consider that the experiments detailed in this paper demonstrate that adaptation to constant heat renders animals more resistant to excessive heat, but markedly reduces their ability to increase combustion and keep warm under chilling conditions. Constant cooling, on the other hand, while making animals much more sensitive to excessive heat, increases their ability to withstand chilling. Most surprising, though, is the response of animals that live for two-thirds of the time at a high temperature, but are chilled daily for a few hours. These animals show a very active heat production to meet chilling emergencies, but are least able to endure a high temperature, even though it be only a few degrees higher than that to which they have been exposed for the greater part of each day.

It is argued from these experimental results that the differences in susceptibility to excessive heat admittedly shown by the inhabitants of different parts of the United States depend on variations in metabolic activity, and that these variations correspond with the type of climatic stimulation to which the people of the several regions are subjected.

W. P. M.

SHATTUCK (George C.) & HILFERTY (Margaret M.). **Causes of Deaths from Heat in Massachusetts.**—*New England Jl. of Med.* 1933. Aug. 17. Vol. 209. No. 7. pp. 319-329. With 1 fig.

A discussion of the factors which influence deaths associated with heat in Massachusetts.

The authors conclude that "sunstroke" and "heat stroke" are indistinguishable clinically and that both of these terms should be replaced by "heat hyperpyrexia." The type of response to exposure to heat shows a definite correlation with age. Hyperpyrexia is far more common than exhaustion between the ages of 20 and 59, but heat exhaustion predominates after 60 years of age. As contributory causes of death from heat, diseases of the circulatory system stand first by a large average. This fact suggests that the circulatory system suffers particularly from the effects of excessive heat, and that the correlation of heat deaths with increasing age is due to progressive diminution of adaptability of the circulatory system to stress of this kind.

W. P. M.

VAN ZWALENBURG (C.). **Dehydration in Heat Exhaustion and in Fatigue.**—*California & Western Med.* 1933. May. Vol. 38 No. 5. pp. 354-358. [32 refs.]

The author's theme is "Drink more water," and to the effects of dehydration he attributes heat exhaustion and fatigue following muscular exertion.

For the average person under moderate strain of mental and physical exercise, six to eight glasses of water daily are recommended. Two or three times this quantity is required by workers under conditions of heat such as are encountered in steel mills, foundries, hot mines and stokeholds of vessels. While in deserts in the tropics, the daily intake of water should amount to about thirteen litres in order to preserve an adequate reserve in the tissues. [The author does not consider the depletion of sodium chloride caused by excessive sweating.]

W. P. M.

MARSH (Frank). **Further Studies in "Heatstroke."**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. Nov. 30. Vol. 27. No. 3. pp. 255-267. With 2 graphs (1 folding). [12 refs.]

This paper, which cannot be summarized satisfactorily, deals with blood and urine chemistry in normal people, and blood chemistry in experimental heat stroke.

The author's experiments support the belief that in non-sweating laboratory animals hyperthermia is accompanied by a rise in blood lactic acid and a fall in plasma bicarbonate, which changes are accompanied, in the case of sweating man, by a fall in blood chloride. It is not clear how hypochloraemia interferes with sweating; possibly the sweat glands are unable to secrete sweat when the blood chloride is low, or, a low blood chloride may induce a secondary reduction in blood volume. A patient with his blood salt low and his bodily salt reserves exhausted will thirstily drink any available water. The blood volume is rapidly restored to its former low level, or even lower, by polyuria and a quick burst of sweating with further loss of chlorides. The vicious cycle can be broken only by the ingestion of salt.

W. P. M.

UNION OF SOUTH AFRICA. ANNUAL REPORT OF THE DEPARTMENT OF PUBLIC HEALTH YEAR ENDED 30TH JUNE, 1933. [**Heat Stroke.** pp. 18-19.]

Natives recruited for the South African mines from tropical areas are only half as susceptible to heat stroke as those from further south

New boys are now acclimatized before being put to work at deep levels.

"During the year 20 fatal cases of heat stroke were reported from deep mines in the central and eastern Witwatersrand areas. Nine mines were involved in these deaths. This makes a total of 130 deaths from this cause on the mines since 1924, in which year a single death was reported from a deep level mine.

"A review of these cases showed that the view previously expressed regarding tribal acclimatisation is confirmed. In Table F the cases are shown according to the region from which the boys were recruited. The first column of figures shows the actual number of deaths. In the second column the deaths are expressed in proportion to the numbers of boys from each region working in the deep levels where the wet bulb thermometer records a temperature of 86°F. or over, it is in these levels that the great bulk of the cases occur. It will be seen that the natives recruited from the cold heights of Basutoland are nearly twice as susceptible as the tropical natives recruited from Portuguese territory. The Eastern Cape Province natives take an intermediate place. It would appear, therefore, that natives recruited from latitudes nearer the equator have a decided advantage in deep level mining over those from further south. Their rare deaths are an extreme expression of this advantage. This advantage must also obtain in less easily assessed ways such as greater working efficiency and lessened susceptibility to disease.

TABLE F.—*Fatal Heat Stroke Cases on the Witwatersrand Mines, 1924 to June, 1933.*

Area of Recruitment	Number of Deaths	Rate per 10,000 of the average number from each region working in hot zone
Basutoland	35	121
Eastern Cape	52	108
Mozambique	33	65
Other Areas	10	—
Total ...	130	

"The importance of local acclimatisation and individual susceptibility is clearly brought out by the figures. Of the 130 cases, 87 collapsed during the first or second shift worked in the hot place. All the deep level mines have now adopted a system of acclimatisation of new boys before putting them on the hard work in hot zones. Various methods have been adopted. The most satisfactory is that of putting the boys on to light work in a moderately warm place, followed by hard work in that place, then light work in the hot place. Light work is best arrived at by issuing only one shovel to every two boys and instructing them to hand over the shovel to another boy on the slightest fatigue. This acclimatisation is usually spread over a period of a fortnight. Heat collapse only exceptionally occurs in boys who have served in an acclimatisation gang; in such cases evasion of proper acclimatisation is generally elicited on investigation.

"In addition to acclimatisation elimination of boys specially susceptible to heat is now carried out on two mines of the Central Mining Rand Mines Group. The method adopted for elimination of such susceptibles consists of setting all recruits to do muscular work in a specially constructed chamber the atmosphere of which is kept saturated with moisture at a temperature of about 94°F. The rise of body temperature under these conditions makes it possible to assess the efficiency of the physiological cooling mechanism. The recruits are divided into three groups according to their reaction in the chamber. Those who show no susceptibility to heat in the chamber served an acclimatisation period of only 5 days, those slightly susceptible 7 days, those markedly susceptible 14 days. This chamber test has already fully justified itself. At the City Deep Mine where it is in full working there has not only been a reduction in the number of heat stroke cases, but also a great saving in working shifts on the mine." [See also this *Bulletin*, Vol. 29, p. 798] A. G. B.

SLEEPING SICKNESS.

DUKE (H. Lyndhurst) Studies on the Factors that may influence the Transmission of the Polymorphic Trypanosomes by Tsetse. IV. On the Spontaneous Disappearance of Flagellates from an Infected Glossina. V. On the Effects of Temperature. VI. On the Duration of the Biological Cycle in Glossina.—*Ann. Trop. Med. & Parasit.* 1933. Oct. 21. Vol. 27. No. 3 pp 431-435; 437-450; 451-467.

iv. An observation is recorded, which, in the author's view, seems to confirm an opinion expressed by BRUCE *et al.*, 1915, viz: "It must, therefore, be held as probable that an infective fly, with presumably both salivary glands and alimentary tract swarming with trypanosomes, can lose all these flagellates and become non-infective."

A batch of laboratory-bred *G. palpalis* was fed for two days on a monkey infected with *T. gambiense*, and then, after being nourished for 16 days on a clean fowl, on several healthy monkeys, all of which became infected in the course of time. On the 43rd day of the experiment the remaining flies were killed and dissected, and in four flagellates were found to be swarming in both the guts and salivary glands. Another male fly, which was dead when removed from the box before its companions had been killed, revealed on dissection a state of affairs which the author had never before seen in ordinary transmission experiments, but which was reminiscent of the effects of feeding infective flies on arsenic-containing blood. This fly had died a natural death and had not fed for some days previous to its death. The intestine was empty of blood, although both glands were found to be crammed with trypanosomes, all of which were motionless and apparently dead, although unaltered in form; no trace of trypanosomes was found in the alimentary canal. Duke's experience convinces him that the fact that the fly had been dead overnight could not be held responsible for this remarkable phenomenon. He believes that the observation suggests that a trypanosome infection may die out from the alimentary canal in Glossina, and that indeed in this particular fly the gut had been cleared of trypanosomes for at least 3 or 4 days previous to its death. He furthermore considered it probable that the flagellates in the glands of this fly had died before its death, and that they would finally have disappeared, either by absorption or ejection, had the insect survived for a sufficient period after their demise.

Although it is highly probable that the phenomenon is of very rare occurrence in the ordinary conditions of experiment or in nature, the possibility of its occurrence must be borne in mind by those engaged in trypanosomiasis research.

v. In this paper Duke has examined the effect of temperature on the development of trypanosomes in *Glossina palpalis*.

The author commences by reviewing the literature of the subject beginning with the observations of KINGHORN and YORKE (1912), who found that "whereas the earlier stages of the cycle may take place at comparatively low temperatures, such as 60°F., for the invasion of the salivary glands high temperatures such as 75°F. to 85°F. are necessary." After referring briefly to the records of BRUCE *et al.* (1915) and of LLOYD (1930), the author discusses in detail TAYLOR's recent experiments (1932) from which it is claimed that increasing

the temperature to 37°C. very greatly increased the infection rate of *G. tachnoides* [this *Bulletin*, Vol. 30, p. 105].

An account is then given of Duke's own carefully controlled experiments on this subject. Every test consisted of a pair of boxes, each containing at the outset about 50 *G. palpalis*. The two boxes of each pair were fed, one immediately after the other, on the infecting animal. One box was then placed in the incubator and the other kept in the laboratory. The experiment was divided into two series. In the first the incubator was kept at 86–88°F, and in the second at 95–98°F. Other details are given, but cannot be referred to here; suffice it to say that the laboratory maintained, and the incubator maintained, flies were otherwise subjected to exactly the same conditions. The trypanosomes used were *T. brucei*, *T. gambiense*, and *T. rhodesiense*.

The results of these two series of experiments are set forth in a couple of tables and the data obtained were subjected to examination

by the formula $X^2 = \frac{\sum (x-m)^2}{m}$. For Series I (laboratory temperature and incubator at 86–88°F), the value for $X^2 = 2.2404$. In Series II (laboratory temperature and incubator at 95–98°F) the corresponding value = 5.0391. From this Duke concludes that whereas the difference between the two values in Series I may well be due to chance, in Series II the higher temperature is in all probability responsible for the greater infection rate shown by the flies.

TAYLOR considered that the increased infection rate in the incubated flies is due to the beneficial effect of high temperature on the trypanosome, helping it in its early efforts at multiplication and establishment in the fly. Duke believes that his experiments (Series II) show this explanation to be inadequate, and that the influence of the higher temperature on the fly itself must be also taken into account. Previous work has shown that *G. morsitans* is about twice as good a transmitter of the trypanosomes of man as is *G. palpalis*, and the work of LLOYD and of TAYLOR suggests that *G. tachnoides* is in certain circumstances even more efficient. Duke considers that differences of the order obtained by him are more easily explicable on the hypothesis that the higher temperature acts through the tsetse fly by affecting its physiological processes in some way favourable to the trypanosome. Duke contrasts in detail the climatic conditions of Nigeria with those of Entebbe, and points out that the differences between life in the incubator at 95–98°F. and that in the laboratory, or in the natural environment of the fly, is very much greater in Uganda than in Nigeria. With *G. palpalis* exposure to 36–37°C. causes a slight increase in efficiency, an increase that may, perhaps, represent the direct effect of the higher temperature on the blood trypanosomes during their first few days in the alimentary canal of the fly. To *G. tachnoides* 37°C. is a temperature well within its normal experience in nature, and brings out to the full its latent capacity to transmit the trypanosome.

vi. As the result of an extensive review of the literature and of an analysis of the accumulated data of his own work during many years at Entebbe, Duke reaches the conclusion that it is very exceptional for the biological cycle of man's trypanosomes in *Glossina* to take more than 30 days for its completion; as a rule, 25 days or less are required.

The first part of the paper is devoted to a review of observations bearing on the length of the cycle of *T. gambiense*, and to a less extent,

of *T. rhodesiense*, in different parts of Africa, including an account of 30 different strains of *T. gambiense* which have been studied at Entebbe since 1926. The second part is devoted to a consideration of trypanosome infections (*T. gambiense* and *T. rhodesiense*) in tsetse flies (*G. palpalis* and *G. morsitans*), which have lived 30 days or longer after their first meal on an infected animal, these infections being restricted to the alimentary canal of the fly and not involving the salivary glands. Duke considers that this information has a definite bearing on the whole question of the transmissibility of trypanosomes by *Glossina*. He points out that an important point of divergence between TAYLOR and himself is that, whereas the former believes that once a fly is infected in the proventriculus, it is merely a matter of time before the glands also become infected, he, Duke, believes that in all but exceptionally transmissible strains there will always be a certain number of flies in which no matter how long they live the glands will never become infected.

In a very lengthy table Duke has accumulated a vast amount of data bearing on this subject. The table gives information regarding the trypanosome used, the infecting animal, the age (after the infecting feed) of the flies on dissection, the day on which the earliest gland infection was found by dissection, the days on which "gut only" infections were found on dissection, and finally the earliest evidence of infectivity of flies acquired by feeding them on clean animals. This table shows that a fly may have its alimentary canal infected with a trypanosome during 5 to 7 weeks of laboratory service without becoming infective.

The general conclusions reached from this stage are.—

"(1) It is very exceptional for the biological cycle of man's trypanosomes in *Glossina* to take more than 30 days for its completion. As a general rule, 25 days or less are required.

"(2) With the majority of East African strains of *T. gambiense* there will always be a certain number of individual infected flies in which trypanosomes never reach the salivary glands, no matter how long the flies live after their infecting feeding." W. Yorke.

LESTER (H. M. O.). **The Characteristics of Some Nigerian Strains of the Polymorphic Trypanosomes.**—*Ann. Trop. Med. & Parasit.* 1933. Oct. 21. Vol. 27 No. 3. pp. 361-395. [46 refs.]

This very interesting paper gives valuable information regarding the various characters exhibited by a considerable number of Nigerian strains of polymorphic trypanosomes, and ends with a discussion regarding the relationship of *T. brucei*, *T. gambiense* and *T. rhodesiense*.

Among the considerations which induced Lester to undertake this work are: (1) that in Eket, Southern Nigeria, sleeping sickness is very mild, whilst in Northern Nigeria it may be either mild, as in the southern portion where *G. palpalis* is the chief vector, or more virulent as in the north where *G. tachinoides* is the chief vector; (2) that from time to time medical officers have reported cases resistant to arsenical treatment; and (3) that great differences exist in the way in which different strains from man behave in small laboratory animals.

Origin of strains.

The first series of strains were obtained from untreated patients attending Gadau Dispensary. These were people who had come

from the big epidemic area to the north of Gadau. Whilst some localities in this area are infested with *morsitans*, this fly tends to be localized to a great extent, so that the ordinary farmer does not come into close contact with it. *G. tachnoides* is obviously the chief vector of trypanosomiasis in the area. About 10 per cent. of the population is infected with the disease, and in some villages infection rates of 60 to 70 per cent have been recorded. During the last two or three years about 10,000 cases of sleeping sickness have been treated from the area.

The other group of strains was obtained from Ayu district, Jemaa division of Plateau Province. Here the infection rate is about 5 per cent., and the chief vector is *G. palpalis*. These Gadau and Ayu strains were compared with 4 *T. brucei* strains isolated in the Gadau district and with two old laboratory strains of *T. gambiense* and *T. rhodesiense*, which had been kept for many years in London.

History of strains.

The Gadau and Ayu strains were isolated by the intraperitoneal injection of 5 cc. of blood from untreated sleeping sickness patients into *Macacus rhesus*. From the monkeys the strains were passed into guinea-pigs, and during the course of these investigations were maintained in guinea-pigs by syringe passage. Strains Gadau 1 to 4 were isolated in May, 1930, Gadau 5 in July, 1929, Gadau 6 in October, 1930, and Gadau 7 in January, 1932. The Ayu strains were isolated in April, 1931, and were used by TAYLOR (1932) for a series of cyclical transmissions in guinea-pigs, after which they were handed over to the author. Ayu 5, 7, 8 and 11 had been transmitted through *G. tachnoides*, and Ayu 6 had undergone one transmission by *morsitans*. The old London *gambiense* strain had been isolated from a patient from Nigeria in November, 1921, and the *rhodesiense* strain from a Luangwa Valley patient in January, 1923. Strain *Brucei* 1 was isolated from wild *G. morsitans* in 1928, and had been maintained since in a series of dogs and monkeys. *Brucei* 2 was isolated from wild *G. morsitans* in May, 1930, and has been since maintained in dogs and guinea-pigs. *Brucei* 3 was obtained from a naturally infected dog in November, 1932, and *Brucei* 4 from wild *G. morsitans* at the same time, both these strains have been maintained in guinea-pigs.

Each of these strains was then examined as regards its virulence in small laboratory animals, the occurrence of posterior nuclear forms, its susceptibility to trypanamide, and its reaction to human serum. Full details of this work are given, and the results are summarized in the table, below, p. 200.

A number of human inoculation experiments were performed with Strain *Brucei* 4. Three Europeans and 40 natives were injected with blood from a rat infected with this parasite. The amount of blood given to each volunteer contained approximately 10 million trypanosomes. Immediately prior to inoculation the strain was tested *in vitro* against normal human serum, which was found to destroy the trypanosomes within 3 to 4 hours. As was anticipated the results were negative in every case.

Lester records that in 1932, when making a strain of *brucei* resistant to human serum in mice, he noticed that a strain completely resistant in mice to a dose of 1 cc. of normal human serum showed no signs of this resistance when tested *in vitro*. This finding was not reported at the time, but it has since been confirmed with another *brucei* strain. Strain *Brucei* 4 was maintained in mice which were treated with increasing intraperitoneal injections of normal human serum, until such time as it had become resistant in the mouse to a dose of 2 cc.

A summary of the characteristics of the various strains.

Strain	Virulence in small laboratory animals	Occurrence of posterior nuclear forms	Dose of trypasamide required to clear trypanosomes from the peripheral blood, gm. per kilogram	Reaction to human serum
Gadai 1	Low virulence	Normal	Greater than 04 gm	Insensitive
" 2	Normal	"	Less than 04 gm	"
" 3	"	Numerous up to 15 per cent	" 04 "	"
" 4	"	Normal	004	"
" 5	"	Up to 4.5 per cent.	Less than 04 gm.	"
" 6	Virulent	Numerous up to 23 per cent	08	Sensitive 3 hours
" 7	Normal	Normal	05	Insensitive
Ayu 5	"	Numerous up to 17 per cent in white mice	008	"
" 6	Virulent	Numerous up to 29 per cent	Greater than 025 gm	Sensitive 3 hours
" 7	Normal	Normal	06	Insensitive
" 8	"	"	14	"
" 9	"	"	06	"
" 11	"	"	05	"
London gamb T	Virulent	—	Less than 04 gm	Sensitive 3 hours
London rhod T.	"	—	Greater than 025 gm	" "
Brucei 1	"	—	" "	Sensitive 6 hours
" 2	"	Numerous	025	" "
" 3	"	"	30	Sensitive 3 to 4 hours
" 4	"	"	025	" "

of serum, which is about the maximum dose a mouse can tolerate. The resistant strain from a mouse and a normal strain from a guinea pig were both tested *in vitro* against normal human serum, and little if any difference could be seen in their behaviour. A dose of 10 million trypanosomes resistant to human serum in mice was injected into one European and 5 native volunteers. The results were again completely negative.

In a lengthy discussion which follows these interesting observations, Lester states that his original object was to ascertain whether *T. rhodesiense* occurs in Nigeria. From this work it appears that not only do strains having all the characteristics ascribed to *T. rhodesiense* occur, but that there is also a whole series of strains with characteristics intermediate between *T. rhodesiense* and *T. gambiense*. He then passes to a consideration of the question of the relationship between *T. gambiense*, *T. rhodesiense* and the game trypanosome in the light of his findings.

It is impossible to do justice to this interesting discussion in the very limited space available here, and those interested should consult it in the original.

W. Y.

CORSON (J. F.). **The Resistance of *Trypanosoma rhodesiense* to Normal Human Blood-Serum in Relation to Cyclical-Passage through Tsetse Flies.**—*Jl. Trop. Med & Hyg.* 1933. Dec. 1. Vol 36. No. 23. pp. 365-367 [11 refs]

An experiment was performed with the object of ascertaining whether a strain of *T. rhodesiense* after cyclical passage through *G. morsitans* was more resistant to the action of normal human serum, when tested *in vivo*, than after a series of mechanical passages.

In his introductory remarks Corson points out that it is now generally recognized that although *T. rhodesiense*, when first isolated from man, exhibits considerable resistance to the action of normal human serum, this resistance is largely lost after a series of mechanical transmissions through experimental animals. Little work has, as yet, been done on the influence of cyclical transmission on this quality. ADAMS found that cyclical transmission (*G. palpalis*) caused diminished resistance, whereas LESTER observed that experimentally produced serum fastness in *T. brucei* was transmitted by *G. tachinoides*.

In a table details are given of the effect of normal human serum on the infections in 32 rats inoculated directly from various human beings infected with *T. rhodesiense*. The dose of serum given varied from 0.5 cc. to 2.5 cc. [unfortunately the weight of the experimental rats is not given, but they are stated to be mostly half-grown; this is obviously a matter of great importance in all work of this nature]. In no instance did the peripheral blood become negative. This shows that at the time of its removal from man *T. rhodesiense* is resistant to human serum.

A strain of *T. rhodesiense* was then obtained from an untreated case of sleeping sickness by inoculation of the blood into a guineapig. *G. morsitans* were infected from this guineapig. Two guineapigs and a rat were infected from the *G. morsitans*. From the rat the strain was carried by direct blood inoculation through 4 further rats and from the 5th passage a number of rats were inoculated in order to serve as a test of the sensitiveness of the strain to normal human serum. The guineapig strains were inoculated into other guineapigs, and on these clean *G. morsitans* were fed. These flies in turn infected a number of rats and also three other guineapigs from which rats were inoculated. These rats (infected either directly by the fly or inoculated from fly-infected guineapigs) served as a test of the sensitiveness to human serum of the strains which had passed twice through *G. morsitans*. The results of the tests are summarized in a table. Each rat was given 1 cc. of normal human serum. In the author's opinion it seems justifiable to conclude from this work that the trypanosomes in the rats infected by tsetse flies, and in those infected from the fly-infected guineapigs, were not more resistant to the action of normal human serum than were those in the rats of a series of mechanical transmissions. W Y.

STEUDEL (Emil). 'Der Kampf gegen die Schlafkrankheit in Kamerun. [Measures against Sleeping Sickness in Cameroon.]—*Deut. Med. Woch.* 1933. Dec. 1. Vol. 59. No. 48. pp. 1798-1800.

This article is a criticism of the French sleeping sickness campaign in the Cameroons.

Steudel states that there can be no doubt that the distribution of sleeping sickness in the Cameroons has increased considerably since 1928. His main criticism appears to be that the French do not maintain

a sufficiently large staff of European doctors to deal adequately with the situation. JAMOT announced in 1930 that the French Government had voted 3,000,000 francs for sleeping sickness work in the Cameroons, and that this made it possible to increase the number of European doctors from 11 to 18, that of European assistants to 36 and that of native assistants to 400. If one remembers that there are in the bush about 130,000 cases of sleeping sickness, this means that there is only one doctor to 7,200 patients. Under the German régime there were 53 doctors, of whom 11 special sleeping sickness doctors and 13 military doctors were concerned in sleeping sickness work, whilst the number of sleeping sickness cases was only 4,000-6,000, i.e., about 167-250 patients per doctor. Such a staff sufficed to produce good results. The French failure is due to the fact that the number of doctors available does not allow a proper search for patients and at the same time proper supervision of treatment. Steudel does not believe that JAMOT is correct, when he says that the accidents (specially blindness) following the use of atoxyl and tryparsamide were few; he thinks that many who suffered in this manner hid away in their huts lest worse should befall them from further treatment.

Other criticisms relate to JAMOT's views on lumbar puncture as an unnecessary guide to treatment, and to the fact that Bayer 205, or the French equivalent, is so little used in the Cameroons. W. Y.

RIOU & MOYNE. Un cas de trypanosomiase à évolution latente anormalement prolongée. [**A Case of Trypanosomiasis of Very Slow Development.**]-*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8 pp. 1090-1091.

Details are given regarding a case of sleeping sickness in which the evolution of the disease was remarkably slow.

The patient was a young girl, aged 12 years, belonging to the Mandiango tribe; she was born at Boudodry near Ziguinchor. When she was 4 years old she came to Dakar and has remained there ever since, not even leaving the immediate environments of the town. There was very little of interest in the history of the case: for a year she had exhibited enlargement of the cervical glands, and at times she appeared to be inattentive and to suffer from loss of memory, but these troubles were transient. When first seen by the authors she presented enlarged lymphatic glands, but no other signs or symptoms. Gland puncture revealed numerous trypanosomes.

W. Y.

LORÉ (A.) & MARTY (J.). De l'efficacité de la tryparsamide chez les trypanosomés en deuxième période. [**Efficacy of Tryparsamide in the Second Stage of Sleeping Sickness.**]-*Bull. Soc. Path. Exot.* 1933. July 12. Vol. 26. No. 7. pp. 959-965.

The authors discuss the question why, though in certain cases of human trypanosomiasis tryparsamide acts like a charm, in others it is a complete failure. The reason for the failures appears to lie in an acquired resistance; the patients who are rapidly benefited by tryparsamide are those who have never before been given the drug, those who are not benefited are the patients to whom tryparsamide was given when they were in the first stage.

For a number of years in the Cameroons the routine bush treatment has been atoxyl-tryparsamide in new cases and tryparsamide alone

in old cases. The great majority of cases so treated are in the first stage. When these cases enter the second stage of the disease tryparsamide no longer has any effect on their lesions; notwithstanding repeated courses of treatment the issue is almost always fatal. Analysis of large numbers of cases at Ayos has shown the authors that the patients who passed into the second stage of the disease, after having received a course of tryparsamide, furnish the greatest proportion of deaths, whilst, on the contrary, the patients in the nervous stage who have not before had tryparsamide are for the most part cured. It is remarked that even though they may have received other arsenicals, *e.g.*, atoxyl or novarsenobillon, they react quite well to tryparsamide. [This interesting and possibly important observation confirms that of CHESTERMAN. Its explanation is not obvious because the reviewer and his colleagues have shown that atoxyl-resistance or salvarsan-resistance on the part of trypanosomes implies tryparsamide-resistance. A possible explanation may lie in the reputed diffusion of tryparsamide through the meningeal barrier, but the subject is one which obviously demands careful investigation on account of its great practical importance.] The authors add that resistance to tryparsamide seems only to be created when it is given before the changes in the spinal fluid have developed. Among 100 patients who died of trypanosomiasis 80 had been given tryparsamide before they passed into the second stage of the disease and only 16 had been given it for the first time when they were in the second stage, of 100 patients who recovered only 16 were given tryparsamide before lumbar puncture showed the spinal fluid to be changed. Interesting details are given of a number of cases falling into each of the following groups: A—Those who had been given tryparsamide before they reached the second stage of the disease; and B—Those who had not been given the drug before reaching the second stage.

The authors conclude from these observations that tryparsamide should be reserved for patients in the second stage of the disease.

W. Y.

SICÉ (A.), COUSIN (E.) & RIVOALEN (P.). De l'utilisation de la tryparsamide appliquée au traitement de la trypanosomiasse nerveuse. [Utilization of Tryparsamide in Treatment of Nervous Trypanosomiasis.]—*Bull. Soc. Path. Exot.* 1933. July 12. Vol. 26. No. 7. pp. 946-958. With 7 figs.

The authors have determined the rate of excretion of tryparsamide in the urine of a number of human beings who were given doses of the drug varying from 0.25 gm. to 3.0 gm. This was done with the object of ascertaining the quantity of the drug retained and really utilized by the organism after the administration of each of these doses. In another patient frequent estimations were made of the amount of arsenic in the blood in order to discover the length of sojourn of tryparsamide in the blood after a dose of 1.0 gm.

The various methods employed for the quantitative estimation of the drug in the urine and blood are described in detail; three methods were used differing with the quantity of the drug present. This portion of the paper, which is of a chemical and rather technical nature, should be consulted in the original by those interested.

In their work on the elimination of the drug the authors confined their attention to the urine; they did this not because they believe that this is the only channel by which arsenic is eliminated after

administration of tryparsamide, but because undoubtedly the great bulk of the drug is eliminated by this medium, and because, of all the excretions, the urine is most easily collected at regular intervals. In all cases the drug was given intravenously in 20 per cent. solution. Analyses were made in each case on the urine passed up to 3 hours after the injection, on the specimens passed between 3 and 6 hours, 6 and 9 hours and 9 to 12 hours, and subsequently on those passed between 12 and 24 hours, 24 and 36 hours, and 36 and 48 hours after injection.

The results of the quantitative analysis of these various specimens of urine from patients who had received respectively 0.25 gm., 0.5 gm., 1.0 gm., 2.0 gm., 2.5 gm. and 3.0 gm of tryparsamide are shown graphically in a series of charts.

In the following table the results obtained after the injection of 0.25 gm. by tryparsamide are shown.

Time after injection	Vol of urine cc.	Tryparsamide eliminated	Concentration per litre
3 hours	470	0.0749	0.1593
6 "	208	0.0266	0.1265
9 "	300	0.0098	0.0328
12 "	750	0.001	0.0012
12-24 "	1,800	0.0021	0.0011

From these figures it appears that during the first 24 hours 0.112 gm. of the drug was eliminated in the urine; consequently 0.138 gm. was retained. From this it is calculated that the "coefficient d'utilisation" is $\frac{0.138}{0.250} = 0.552$. It is noted that the drug continued to be eliminated during the following days, but that after the 7th day only traces which could not be measured were discovered.

Dose of tryparsamide given	Amount of tryparsamide found in urine during first 24 hours	Coefficient d'utilisation
0.25 gm	0.112 gm.	$\frac{.138}{.250} = .552$
0.50 gm.	0.117 gm	$\frac{.383}{.500} = .766$
1.00 gm.	0.313 gm.	$\frac{.687}{1.000} = .687$
2.00 gm.	1.643 gm.	$\frac{.357}{2.000} = .178$
2.50 gm.	2.093 gm.	$\frac{.407}{2.500} = .162$
3.00 gm	2.438 gm.	$\frac{.562}{3.000} = .187$

In the same way the "coefficient d'utilisation" was calculated after each of the above-mentioned doses; the results obtained have been summarized by the reviewer in the above table.

In the single case in which the quantity of tryparsamide in the blood was determined at various intervals after a dose of 1.0 gm. of the drug the following figures were obtained.

Time after injection of tryparsamide	Quantity of tryparsamide in a litre of blood
30 mins	0.02143 gm.
1 hour	0.01494 gm.
2 hours	0.00972 gm.
3 "	0.00705 gm.
5 "	0.00262 gm.
7 "	0.00240 gm.
24 "	0.00074 gm.
48 "	0.00070 gm.
72 "	0.00040 gm.

Analyses were not continued beyond 72 hours, because it was impossible to estimate such minute amounts with any degree of accuracy. Attention is drawn to the fact that the amount of tryparsamide in the blood after 2 hours (assuming the volume of this to be 5,000 cc.) was only 0.0486 gm., and that consequently no less than 0.9514 gm. had disappeared within this short period.

Summarizing these observations, it appears that whatever the dose of tryparsamide given—0.25 gm. to 3.0 gm.—a considerable proportion is eliminated in the urine within the first 3 hours; and the larger the dose the larger the quantity eliminated. After the first 24 hours the amount excreted becomes less and less, and after about the tenth day falls to such minute traces that they cannot be estimated quantitatively. Attention is drawn to the interesting fact that diuresis during the first 3 hours after administration of the drug accelerates its elimination in the urine.

The authors conclude that only a very small proportion of the dose of tryparsamide administered is retained and utilized by the organism in the effective combination which makes this drug so valuable in the therapy of the nervous stage of trypanosomiasis.

W. Y.

BARLOVATZ (A.); CHESTERMAN (Clement C.) **Dosage of Tryparsamide in Treatment of Sleeping Sickness.** [Correspondence.]—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. Nov. 30. Vol. 27. No. 3. pp. 326-327; 327-329.

Barlovatz criticizes certain of the conclusions reached by Chesterman in his recent paper on the treatment of second-stage *T. gambiense* infections [this *Bulletin*, Vol. 29, p. 638-9]. He admits that, as Chesterman's figures for cures with high single doses are 50 per cent. as against 11.4 per cent. for small single doses, the correlation is striking. If, however, the cases be classified according to the total dosage given without regard to the size of the individual doses, then the tables show 22 per cent. of cures for a total dosage of less than

20 gm as against 33 per cent for a dosage of above 20 gm. Barlovatz hence considers that the total amount of drug injected is of importance. Furthermore, there appears to be some correlation between the severity of the nervous changes and the effect of treatment, Chesterman's cured patients had a mean cell count of 338, whereas those who died had 466. Chesterman's cases were mostly in very bad condition at the time of treatment and cannot be compared with the "secondary" cases usually encountered in routine sleeping sickness work. Before accepting his conclusions Barlovatz asks whether the cases to which Chesterman gave respectively large and small doses were selected quite at random, or whether they were chosen according to their supposed ability to stand high or low doses. This seems a fair question because it has long been the general practice to give small individual doses to bad cases.

Chesterman agrees that the total dosage should not be less than 20 gm, but he is at a loss to understand how Barlovatz deduces from his tables that 22 per cent. of cures were obtained with less than 20 gm and 33 per cent by over 20 gm. He himself quotes figures from the tables which make it difficult for him to accept the need for long courses in the type of case with which he had to deal, it is possible, however, that the majority of cases treated by field missions may do as well on prolonged medium, or small doses, especially if they come from newly prospected regions where there has been no possibility of the creation of resistant strains by inadequate treatment. He does not agree with Barlovatz's generalization that his cured cases had a lower spinal fluid cell count than had the fatal cases; and he re-asserts his previous conclusion that "The response of second-stage cases cannot be foreseen from the cell count of the cerebrospinal fluid." Chesterman agrees that in very advanced cases a preliminary small dose is justifiable

W. Y.

BARLOVATZ. Addendum à une communication sur les accidents dus au trypanarsyl. [Accidents due to Trypanarsyl].—*Bull. Soc. Path. Exot.* 1933. July 12. Vol. 26. No. 7. pp. 929-930.

In continuation of his recent paper on this subject [this *Bulletin*, Vol. 30, p 787], the author gives details of a chance observation which suggests that it is not safe to judge of the toxicity for the human subject of any sample of trypanarsamide from its effect on small rodents.

A solution was made of a sample of trypanarsyl (series 1161) several years old, and some of it was injected into rats and the remainder into a number of cases of sleeping sickness. The rats received the following doses:—4 rats 1 gm. per kilo; 4 rats 2 gm. per kilo; 4 rats 3 gm. per kilo; and 4 rats 4 gm. per kilo of body weight. An hour later the same solution was injected intravenously, in an average dose of 0.04 gm. per kilo. (2 gm. per adult of 50 kilos.), into 30 sleeping sickness patients. All the patients quickly exhibited violent reactions, vomiting, rapid pulse, feebleness, sense of dissolution and prostration, these symptoms lasted some hours. Nobody died and the next day most of the patients were better, but some complained of headache. The rodents, on the contrary, exhibited no reaction whatsoever.

The author points out that many arsenical preparations, e.g., salvarsan and its derivatives, are habitually first tested by trial on small rodents. The present observation indicates that toxicities of an arsenical for small rodents and for man are not necessarily parallel.

W. Y.

VAN DEN BRANDEN (F) & POTTIER (R.) Au sujet d'accidents dus à la tryparsamide et produits similaires. [**Accidents due to Tryparsamide and Similar Products.**]*—Bull. Soc. Path. Exot.* 1933 Oct 11. Vol 26 No 8 pp 1022-1026

The authors suggest several reasons for the serious accidents (deaths and blindness) which BARLOVATZ had from time to time in the treatment of sleeping sickness with tryparsamide [this *Bulletin*, Vol 30, p. 787].

BARLOVATZ encountered 22 instances of rapid death among the 1,700 patients treated, and in one day alone he had to deplore no less than 9 deaths. He records that the water used for dissolving the drug was heated to 70°C and that the syringes had been rinsed out with carbolic acid. Van den Branden and Pottier in commenting on this pointed out that BARLOVATZ had not taken the precautions indicated years ago by POWERS, WEIGHTMAN, etc., the original manufacturers of the drug. Tryparsamide in the crystalline form is stable, but nevertheless is decomposed by chemical emanations and by high temperature and strong light. Solutions are less stable, and consequently must be freshly prepared. They must not be heated and not be exposed to chemicals and especially to phenol. The essential precautions are the use of sterile freshly distilled water as a solvent, the sterilization of the instruments, and strict asepsis.

In support of their contentions van den Branden and Pottier record a number of experiments performed on rabbits and rats. In these experiments, solutions of the drug were prepared in the five following ways:—

Method A. The correct method outlined above.

„ B. The drug was dissolved in distilled water at a temperature of 70°C. and then allowed to cool to 30°C. before injection.

„ C. As B, but injected at a temperature of 42°C.

„ D. The solution was boiled for 5 minutes and then cooled to 30°C. before injection.

„ E. The syringe was rinsed in 5 per cent. carbolized water and then, after being properly drained, was used for injecting the drug [the solution was presumably made in the orthodox manner].

Rabbits injected intravenously with a dose of 1.25 gm. per kilo.

Method A. 5 rabbits; no deaths, total gain in weight 515 gm

„ B. 6 rabbits, 1 death on 5th day, total loss of weight 780 gm.

„ C. 5 rabbits; no deaths, total loss of weight 350 gm.

„ D. 6 rabbits; 1 death on 3rd day; total loss of weight 910 gm

„ E. 6 rabbits; 1 death on 2nd day, 1 death on 6th day and 1 death on 8th day; total loss of weight of others. 620 gm

Rats injected subcutaneously with a dose of 3 gm. per kilo

Method A. 3 rats; no deaths, 1 exhibited nervous symptoms

„ B. 3 rats; 1 death; 2 exhibited nervous symptoms

„ C. 3 rats; 1 death; 1 exhibited nervous symptoms

„ D. 3 rats; 3 deaths on 4th, 5th and 6th days, respectively..

„ E. 3 rats, 2 deaths; 1 exhibited nervous symptoms

Rats injected intravenously with a dose of 1.5 gm per kilo

Method A. 3 rats, no deaths, 1 exhibited nervous symptoms.

" D 3 rats, no deaths, 2 exhibited nervous symptoms.

" E 3 rats, no deaths, 2 exhibited nervous symptoms

From these experiments it is concluded that heating the solution to 70°C., or boiling it, or rinsing the syringe with carbolic acid, increases the toxicity of the drug [The authors may be right, but their data are not entirely convincing. In the reviewer's opinion they have hardly made sufficient allowance for the well-known variations in tolerance exhibited by individual animals of the same species]

W Y

DE MARQUEISSAC (H.). Emploi de la médication mixte conjuguée : 205 Bayer-309 Fourneau + tryparsamide dans le traitement des réinfestations sanguines ou des échecs cliniques constatés chez les malades atteints de trypanosomiase à virus gambiense. [*Mixed Treatment of Bayer 205-Tryparsamide in Blood Reinfestations or Relapses (gambiense).*—*Bull. Soc. Path. Exot* 1933. Oct. 11. Vol 26 No. 8. pp. 1051-1060.

This paper records the results of treating a large group of sleeping sickness patients in Togoland with a combination of Bayer 205 and tryparsamide. The considerations which induced the author to undertake this work were firstly that a certain proportion of cases were not sterilized by arsenicals alone, and consequently constituted a reservoir of the virus from which *Glossina* and other cases became infected; and secondly that the reviewer and his colleagues had shown that "arsenic-resistance" of trypanosomes is transmitted unimpaired through *Glossina*, and that this fact constituted a serious criticism of the French method of prophylaxis by wholesale atoxylization.

Dr. Marqueissac states that he did not attempt to use Bayer 205 (Fourneau 309) before any other treatment because of its cost, although he regards this as the ideal procedure. During the last 15 months he has, however, treated all cases in which arsenicals had proved impotent in the following manner—The duration of the course of treatment was 12 weeks. During the first 4 weeks a weekly intravenous injection of Bayer 205 was given, the doses being 0.75 gm, 0.85 gm., 1.0 gm. and 1.5 gm. During the next 8 weeks a weekly subcutaneous injection of tryparsamide in the dose of 2.5 cgm. per kilo of body weight

On Jan. 1, 1933, there were 8,073 cases of trypanosomiasis in the Pagouda sector of Togoland and of these 5,675 (70 per cent.) had been diagnosed since Jan. 1, 1931. The re-examination of 6,800 old cases diagnosed between 3 months and 4 years previously showed 409 (6 per cent.) to be still infected, notwithstanding previous treatment, and 230 of these were given a mixed treatment of Bayer 205 and tryparsamide. This method of treatment was inaugurated in March, 1932; in April, 1933—1 to 4 months after cessation of treatment—the blood of 167 was re-examined, and 156 (91 per cent.) were found to be free from infection. The previous treatment administered to these 167 cases was as follows:—

63 (37 per cent.) had been given one or several courses of tryparsamide.
46 (26 per cent.) had been given one or several courses of atoxyl.

49 (30 per cent.) had been given one or several courses of tryparsamide and trypoxyl.

9 (3 per cent.) had been given one or several courses of orsanine

It is noted that of the whole 230 patients treated by this method during the last 15 months, only 6 had died

Clinical relapses—In certain patients the disease appears to progress towards incurability, notwithstanding all sorts of arsenical treatment; in fact arsenic seems merely to accelerate its progress. Since November, 1931, the author has used at the Pagouda dispensary and in the 19 centres for treatment in the sector, a mixed (synergic) treatment of Bayer and tryparsamide for all patients in the third stage, whether they be old cases or only recently discovered. The treatment consists in giving every 6 or 7 days an injection consisting of the two drugs. They are injected one immediately after the other, without withdrawing the needle from the vein, the titre of the solutions used is 1 gm. of each drug in 5 cc. of distilled water. A course consists of 10 to 12 injections. The first dose given is 0.5 gm. of moranyl followed by 0.5 gm. of tryparsamide. If, after 3 or 4 injections, there is improvement, the amount of tryparsamide is slowly increased without altering that of moranyl, but the dose of tryparsamide never attains to the maximum therapeutic dose of the drug. Only 13 of 341 bad cases treated by this method during a period of 15 months have died.

The only serious ill-effect noticed in the treatment of these cases was that 5 of them developed an exfoliative dermatitis which proved fatal in two patients

The article closes with an interesting note on the subject of Bayer 205 and albuminuria. Trypanosomes were found in the blood of 33 cases at Pagouda between Nov. 1932 and Jan. 1933. None of these had previously received any treatment. The urine of all was examined before and after treatment, in 25 (75 per cent.) of the cases albumen was found varying in amount from a trace up to (in 9 cases) a quantity equal to 1 gm. In 20 of these 25 patients the albuminuria disappeared completely after the first doses of Bayer 205, and in the remaining 5 patients there was a pronounced decrease in the amount. W. Y.

BERNY (P). Action des arsénobenzènes sur les trypanosomes [*Action of Arsenobenzol on Trypanosomes.*—*Bull. Soc. Path. Exot* 1933. Nov 8. Vol 26. No. 9 pp. 1161-1162.

Observations on three patients are recorded, which, in the author's opinion, afford support to the contention of HECKENROTH and BLANCHARD (1913) that neosalvarsan, although sufficing to sterilize the peripheral blood, fails to clear the lymphatic glands of trypanosomes [this *Bulletin*, Vol. 2, p. 587].

Berny points out that although this observation of HECKENROTH and BLANCHARD has never been confirmed, the arsenobenzols have disappeared completely from the therapy of human trypanosomiasis. He himself has, however, been able fortuitously to note the same phenomenon in two cases of syphilis and one of yaws. The first patient was given a dose of 0.3 gm. of novarsenobenzol, and the second two doses of 0.3 gm. and 0.45 gm. respectively. Two days after the last dose it was discovered that the patients had enlarged cervical glands: puncture revealed numerous trypanosomes in both cases, whereas triple centrifugations of the blood gave negative results. The

third patient, who had a generalized yaws eruption, was given 0.06 gm. and 0.12 gm. of sulpharsenol, in this case also numerous trypanosomes were found in the glands 48 hours later, but none in the blood. W Y.

VAN HOOF (L.). Essai d'un nouveau dérivé antimoine organique, Dn 12, dans la trypanosomiase humaine. [**Trial of a New Antimonial Derivative, Dn 12, in Human Trypanosomiasis.**]*—Ann. Soc. Belge de Méd. Trop.* 1933 Oct 30. Vol. 13. No. 3. pp. 345-366.

This paper records the results obtained with the preparation Dn 12 in the treatment of human trypanosomiasis. This substance, which is a pentavalent antimonial compound of oxyquinoline, is a product of the Union Chimique Belge, and has already been tested on experimental animals infected with various trypanosomes [this *Bulletin*, Vol. 30, p. 788]. It is an orange-yellow powder, easily soluble in water, and stable.

A 5 per cent. solution of the drug was made in sterile distilled water and it was given intravenously in doses of 0.25 gm. to 0.50 gm. In all, 26 cases were treated: 7 with little or no meningeal reaction, 3 with definite meningeal reaction, 2 very advanced cases, 8 patients who had been previously treated with other drugs without success, 1 patient who had a double infection of syphilis and trypanosomiasis and who was given neosalvarsan as well as Dn 12, and finally 5 cases who had been found to have arseno-resistant infections. Detailed protocols of all these patients are given. The general plan of treatment appeared to be the administration of 0.5 gm. twice weekly until the patient had received a total amount of 5.0 to 10.0 gm. Many patients, however, were unable to tolerate such large amounts and, consequently, the individual dose had to be reduced to 0.25 gm. In a number of cases the larger dose provoked a crisis ranging from premonitory salivation, nausea and vomiting to short syncope or even to an attack which may resemble in all respects a definite anaphylactic crisis. In one patient who had already received a number of weekly doses of 0.25 gm. a similar dose was unexpectedly followed by a crisis of extreme gravity. Some minutes after the injection the patient had a sudden syncope, with vomiting, and this was followed by a period of shock which lasted more than four hours; there was mydriasis, and subsequently myosis and blepharospasm, thready pulse, stertorous respirations with periods of apnoea, conjunctival injection, deviation of the eyes and relaxation of the sphincters. The author remarks that these shocks were so grave that he would have been unable to continue his investigations had he not found that preliminary treatment of the patient with sodium hyposulphite greatly reduced the tendency of the antimonial to produce shock. The hyposulphite (2 gm. in water) was either given orally two hours before the injection of Dn 12, or it was injected intravenously (0.5 gm.) immediately before the antimonial. It is noted, however, that the efficacy of the hyposulphite seemed to decrease after a time and the author recalls that he has observed towards the end of a series of injections of Dn 12 unpleasant symptoms in patients notwithstanding the previous administration of sodium hyposulphite.

Even in the absence of immediate shock the drug may produce poisonous symptoms as the result of accumulation. These are headache, buzzing in the ears, various neuralgias and myalgias, loss of appetite, emaciation, anaemia, insomnia, and psychical excitation.

The most characteristic lesion is, however, antimonial dermatitis, which was seen in 4 cases.

The drug was found to exhibit a definite trypanocidal action, it not only sufficed to sterilize the peripheral circulation, but in certain cases exercised a favourable influence on the cerebrospinal fluid. In certain cases, however, the drug was not only without action, but actually seemed to aggravate the condition. In an endeavour to explain these diverse results van Hoof points out that 17 of the cases were drawn from an endemic zone situated to the east of Léopoldville. The inhabitants of this area have, for a variety of reasons, only received insufficient treatment during the last 20 years and it is quite possible that during this period drug-resistant strains have gradually developed and are now being transmitted by *Glossina*.
W. Y.

V. ISSEKUTZ (B). Beiträge zur Wirkung des Germanins Mitteilung I & II. [On the Action of Germanin.]—*Arch. f. Experim. Path. u. Pharm.* 1933 Nov. 24. Vol. 173. No. 4-6 pp. 479-498. With 5 figs. [14 refs.]; pp. 499-507.

The experiments described in these papers were devised with the object of throwing light on the mechanism of the action of Bayer 205.

A technique was first developed whereby it was possible to measure the consumption of oxygen *in vitro* by a stated number (100 millions) of trypanosomes. The nutrient medium used was a modification of that introduced by the reviewer and his colleagues (1929). These authors had shown that provided the concentration of trypanosomes did not exceed about 2,000 per cmm., they could be kept alive *in vitro* at 37°C on a medium consisting of equal parts of deactivated serum and Ringer-glucose solution for at least 24 hours. If, however, the concentration of parasites greatly exceeded this, then the trypanosomes died from want of glucose. Issekutz surmounted this difficulty at first by dialysis, but later by the simple expedient of adding his nutrient medium to tubes containing a little agar in which was incorporated 0.5 to 1.0 per cent. glucose: the sugar slowly diffused into the medium thus replacing what was removed by the trypanosomes. By means of a manometer it was possible to estimate the consumption of oxygen by certain known numbers of trypanosomes—the CO₂ was absorbed by filter paper moistened with 5 per cent KOH.

Experiments performed with the aid of this technique showed that although neosalvarsan and trypaflavin greatly reduced the oxygen consumption of the trypanosomes and, in fact, actually destroyed the trypanosomes, "Bayer 205" failed to do either. A series of normal rabbits were then injected with 50 mgm. per kilo. of neosalvarsan, with 100 mgm. of atoxyl and with 100 mgm. of "Bayer 205" respectively. Blood was removed at intervals, and the effect of the various specimens of serum obtained on the oxygen consumption of trypanosomes *in vitro* ascertained. It was found that the serum of the rabbits which had received neosalvarsan or atoxyl were trypanocidal up to 24 hours after injection, but that the serum of the Germanin animal was without action.

Further observations made on infected rats showed that no matter what the degree of infection was at the time of administration of "Bayer 205," the drug exerted no obvious effect on the number of trypanosomes for at least 12 hours, and that it was not until the 16th to the 22nd hour that there was a great decrease in the number of

parasites. If infected rats were bled 6 to 9 hours after treatment with Germanin, the trypanosomes were found to exhibit their usual activity, but their capacity to consume oxygen and sugar was greatly decreased. Although such trypanosomes could be maintained alive *in vitro* at room temperature for 24 hours, *i.e.*, longer than they would have lived *in vivo*, yet, if the *in vitro* temperature were raised to 37°C., the parasites died as quickly as they would have done in the vertebrate host itself. From these experiments, the author concludes that there exists in the blood of an infected animal after treatment with "Bayer 205," a trypanocidal substance which is capable of acting only at body temperature.

Issekutz then performed a series of experiments in which infected rats treated with "Bayer 205" were killed at various times before and after the disappearance of the trypanosomes, and the trypanocidal power of the serum examined *in vitro* at 37°C. From these experiments he concludes that trypanocidal substances are not present in the blood up to the time of disappearance of the trypanosomes, but immediately after this event they begin to appear and as time goes on rapidly increase in amount. In the author's view a possible explanation of this phenomenon is that at first the trypanocidal substance is formed in such small amounts that it is all absorbed by the trypanosomes and so none is free in the serum, but after all the parasites are killed the trypanocidal substance continues to be produced and accumulates in the serum. It cannot be denied, however, that this hypothesis could only hold if it is found that "Bayer 205" is active after the entire reticulo-endothelial system is blocked, because it is only in this way that the production of immune bodies could be prevented. [Before Issekutz's hypothesis could be accepted it would certainly be necessary to exclude what appears to the reviewer to be the simplest explanation of the phenomenon, *viz.*, that it was due to antibody formation.]

ii. A number of experiments were performed in which heavily infected rats were killed by bleeding at various intervals (4-9 hours) after treatment with Germanin (20-30 mgm. per 100 gm. of body weight). The trypanosomes were separated by centrifugation from the plasma, and then by the aid of Lang's colorimetric method (1931) the amount of "Bayer 205" present in the trypanosomes and plasma respectively was ascertained. The parasites were found to contain only 5-10.5 mgm. per cent. of the drug as compared with 24-42 mgm. per cent. in the serum. It is pointed out that 150 mgm. of trypanosomes did not contain sufficient drug to cure a lightly infected mouse. The oxygen consumption of these drug-laden trypanosomes *in vitro* was not decreased. Inoculation of such trypanosomes obtained from rats 9 hours after treatment was still infective for healthy animals, although the duration of the disease was prolonged. W. Y.

REINER (L.) & CHAO (S. S.). **Some Observations on Trypano Agglutinins and Lysins and their Production with Killed Trypanosomes.**—*Amer. Jl. Trop. Med.* 1933. Sept. Vol. 13. No. 5. pp. 525-534. [26 refs.]

Attempts were made to immunize rats against *Trypanosoma equiperdum* by means of vaccines consisting of dead trypanosomes.

In their early experiments the authors endeavoured to immunize rats and rabbits with trypanosomes killed by heat or by formaldehyde, but neither method proved successful. Finally, it was found that parabenzoquinone will kill trypanosomes in a fairly high dilution, but

does not destroy their morphology as do most of the other substances tested.

Preparation of the vaccines and immunization.—A $\frac{1}{50}$ molecular solution of quinone was prepared in physiological saline, and $\frac{1}{10}$ cc of this solution was then added to 2.9 cc. of an emulsion of *T. equiperdum* in physiological saline and the mixture kept at room temperature for 30–120 minutes. As soon as microscopical examination of the suspension failed to reveal any evidence of motility among the trypanosomes, the emulsion containing about 100 million trypanosomes was injected into a rat. Eleven such injections were given within 14 days, and six to ten days after the last the rats were either bled to death, if it was desired to examine the agglutinating capacity of the serum, or they were inoculated with living trypanosomes if their resistance was to be tested.

For the determination of the agglutinating and lytic power of the immune serum, a suspension of living *T. equiperdum* in rat serum, inactivated at 56°C, was used, and to this was added varying quantities of immune serum. If no complement was added and the serum to be tested was inactivated, agglutination only occurred and no lysis. Fresh rat immune serum, or inactivated rat immune serum mixed with complement, also caused lysis of the trypanosomes if kept at 37°C. for 20 minutes. The results of four agglutination experiments are given in a table, from which it is seen that the agglutination titre was in one case 16, in two cases 32, and in one case 64. Readings were taken after 15 mins at 37°C. Further experiments showed that there was a parallelism between the agglutinating and lytic powers of the sera, which, in the authors' view, suggests the identity of sensitizing and agglutinating antibodies.

The immune sera prepared in this way all showed a strict strain specificity without group reaction, *e.g.*, the strain of *T. equiperdum* maintained in rats behaved differently from the same strain passed through guinea-pigs.

The results of one of the experiments, to test the acquired immunity of some of the immunized rats by injecting them with living *T. equiperdum*, are summarized in a table. It was found that the immunized rats always survived longer than the normal rats, but absolute immunity against experimental infection with 100,000 to 300,000 trypanosomes was only obtained in a small percentage of cases.

W. Y.

SCHILLING (Claus), with SCHRECK (H.), NEUMANN (H.) & KUNERT (H.).

Immunisierung gegen Trypanosomenkrankheiten [**Immunization against Trypanosomal Diseases.**].—*Deut. Med. Woch.* 1933.

Oct. 20. Vol. 59. No. 42 • pp. 1603–1604; and *Bull. Soc. Path.*

Exot. 1933. Oct. 11. Vol. 26. No. 8. pp. 1004–1008.

As the result of his reflections on the reason for the remarkable tolerance exhibited by the African antelope and other game animals to trypanosomes which are highly pathogenic for domesticated animals, Schilling puts forward the hypothesis that it is due to an immunity acquired shortly after birth, and that this immunity throughout life is constantly reinforced by bites of infected tsetse. In order to put this hypothesis to the test he performed a number of preliminary experiments.

The earlier experiments, which were conducted in 1913–1914 on calves and *T. brucei*, are not entirely satisfactory, as the strain was not

very virulent for cattle. The later experiments were conducted in Berlin between 1930 and 1932. In these, foals and the highly virulent *T. congolense* were used.

A foal born on 16 Oct., 1930, was given 8 days later a subcutaneous injection of dried *T. congolense* antigen. On the 18th and 23rd days after the vaccination the animal was bitten by *G. morsitans* (bred in the Robert Koch Institute) infected with *T. congolense*. This was followed by a period of irregular fever, which lasted up to the 67th day, thereafter, except for occasional rises, the temperature remained normal, the last febrile disturbance being on 2nd May, 1932. Trypanosomes were last seen on 23rd Feb., 1932. The weight had increased from 40 kgm. to 400 kgm. on 20th Sept., 1932, and the animal was healthy and active. On 20th Sept., 1932, its blood was injected into mice with negative results. On 22nd Sept., 1932 (23 months after vaccination), infected tsetse were again fed on it with the result that there was an energetic reaction—fever, loss of weight, and trypanosomes in the blood. Three further infections by means of tsetse produced but slight reactions.

A second foal was infected by tsetse and then treated by a half curative dose of antimosan, and subsequently subjected to the bites of infected tsetse. This animal behaved very much as the previous one. Schilling intends to apply his methods in Tanganyika. W Y.

KRIJGSMAN (B. J.). Biologische Untersuchungen ueber das System: Wirtstier-Parasit. III. Teil: Das Verhalten der Blutproteine und IV. Teil: Das Verhalten des Blutzuckers wahrend der Entwicklung von *Trypanosoma evansi* in der Ratte. [Biological Investigations on the System: Host-parasite. III. The Behaviour of the Blood Proteins, and IV, the Behaviour of the Blood Sugar during the Development of *T. evansi* in the Rat.]—*Ztschr. f. Parasitenk.* 1933. Sept. 6. Vol. 6. No. 1. pp 1-22. With 5 text figs. [63 refs.]

Experiments were performed with the object of ascertaining whether any changes occurred in the various serum proteins or in the blood sugar titre during the course of *T. evansi* infections in rats.

The author remarks that the system "trypanosome-mouse" in which the progressive inhibition of division is absent is less complicated than the system "trypanosome-rat" in which three factors, which inhibit development of the parasite, appear. Since, however, the technique for chemical analysis of the blood necessitates more blood than can be obtained from the mouse he was compelled to use the "trypanosome-rat" system. Estimations of the protein fractions required about 1.5 cc. of blood, and hence it was not possible to make a series of investigations on one animal; accordingly, a number of rats were infected with similar quantities of the parasite at the same time, and every six hours afterwards an animal was sacrificed and its blood collected. In this way it was possible to reconstruct curves of the trypanosome development and concentration of blood proteins. The technique employed for estimating the protein fractions was that of von Ruzsnyak (1923), it consisted essentially in precipitating the various proteins with different concentrations of ammonium sulphate solution and estimating the cloudiness produced by a nephelometric method (Pulfrich's photometer). As the technique for determining the blood sugar titre (a modification of Folin's with the aid of a Pulfrich's photometer) required only 25 cmm. of blood, it was possible to follow the

blood changes throughout the course of the infection in a single animal.

In the work on the serum proteins 33 rats were killed in various stages of the infection. The results of the analyses, which are set forth in a table, show that the blood proteins remain unchanged throughout the course of the disease, whether its development be rhythmically progressive, slowly progressive, or intermittent. There was no definite variation either in the content of total blood protein or in that of any of the protein fractions.

Similarly blood sugar estimations made in rats in which the infection was—(i) rhythmically progressive, (ii) slowly progressive, or (iii) intermittent, failed to reveal any definite changes apart from the well-known pre-agonal hypoglycaemia. Experiments were then conducted to ascertain whether altering the blood sugar content either in the positive direction by the administration of adrenalin and glucose, or in the negative direction by insulin had an influence on the infection. From the first of these experiments it is concluded: that the sugar content of normal blood is in excess of that required for the metabolism of trypanosomes, that raising the sugar content does not accelerate the development of the parasites, and that adrenalin itself has no direct action on the trypanosome development; and from the second—that there is always in the blood an amount of sugar in excess of that required by the trypanosomes and that insulin has no action on the development of the parasites

W. Y.

TOPACIO (Teodulo). A Simple Technic for isolating Single Trypanosomes.—*Philippine Jl. Sci.* 1933. Aug. Vol. 51. No. 4 pp. 631–635. With 4 plates.

The technique consists essentially in making a stock suspension of trypanosomes in 30 per cent. plasma of such strength that when a small drop is examined under the low power of the microscope, it is found to contain 3 or 4 organisms. From this stock suspension a series of minute drops are transferred by means of a capillary glass rod with a rounded end to a strip of sterile cellophane paper mounted on a glass slide by means of sterile serum. About 10 separate drops are deposited on the cellophane paper 8 mm. apart. The drops are then examined under the low power of the microscope. Immediately a drop is recognized to contain only a single organism, a little more 30 per cent. plasma is superimposed, and the observer then passes to the examination of the other drops. The author remarks that it is often possible by this simple procedure to obtain 3 or more drops containing single organisms. Each drop with a single organism is removed from the slide by cutting a small square through the cellophane paper mount around the drop. The article is clearly illustrated by a number of plates.

W. Y.

CORSON (J. F.). A Modification of Lloyd and Johnson's Method of Proboscis and Gland Dissection in Tsetse Flies.—*Ann. Trop. Med. & Parasit.* 1933. Oct. 21. Vol. 27. No. 3. p. 481.

The author recommends the following technique for removing the salivary glands from *Glossina*,:—

“Instead of first removing the head with the glands from the thorax, the head and thorax preparation is laid on its back in normal saline, the left needle slightly pierces the thorax about between the third pair of legs to hold the specimen, while the right needle is laid horizontally across

the base of the proboscis. By gentle pulling, the proboscis is pulled off the head and draws the glands out with it. It is easy to do and is successful with freshly killed flies." W. Y.

JACKSON (C. H. N.) **On the True Density of Tsetse Flies.**—*Jl. Animal Ecology*, 1933. Nov. Vol. 2. No. 2. pp. 204-209
 — **On a Method of marking Tsetse Flies.**—*Ibid* pp. 289-290

Our present knowledge of the numbers of wild tsetse flies is based almost entirely on the fly-count, but this is affected not only by the number of the flies, but also by their activity at the time when the count is taken. In spite of their manifest imperfections, far-reaching conclusions have been drawn from fly-counts. The author feels that some entirely new technique is necessary.

Jackson points out that, if one could find an area inhabited by *Glossina* and completely surrounded by some type of vegetation which that insect does not pass, it should be possible to arrive at an absolute estimate of the total number of flies. This he would do by catching, marking and liberating a certain number. After an interval, a considerable number of flies would be recaptured, the ratio of the marked to the unmarked giving a measure of the population assuming that no deaths or births had occurred. After preliminary work, this method was applied to an area of about $2\frac{1}{2}$ square miles which was inhabited by *G. morsitans* and almost completely surrounded by impassable barriers. Flies were caught and marked on five successive days, and on the three following days a large number were recaptured. Assuming that the mean duration of life is one month, i.e., that 3 per cent. of flies die daily, the conclusion was arrived at that the area contained a population of a little under 2,000 male *morsitans*. [It is known that marked flies are occasionally recaptured after long intervals, so that it is clear that the method does not generally do them serious harm. But we believe that nobody has ever investigated the death-rate in cages among marked and unmarked flies; it may well be that there is a considerable death-rate, particularly in the day or two following the manipulation. If it could be shown that marking causes no increase in death-rate, then the author's investigations could most profitably be extended, for the gradual disappearance of the marked flies would be a measure of the deaths among the unmarked.] The author also considers the possibility of applying some similar method to an area which is not isolated, and which receives and loses flies continually. He suggests a theoretical method of studying such a problem, but he has not yet been able to obtain results which he can accept.

The second paper describes ingenious methods of marking *Glossina* with oil paints. They can be marked on a two-colour system, which enables each day's batch to be distinguished over a long period. There are, moreover, individual marks which can be applied to a particular fly even if it is recaptured on more than one occasion. P. A. Buxton.

NASH (T. A. M.). **A Statistical Analysis of the Climatic Factors influencing the Density of Tsetse Flies, *Glossina morsitans* Westw.**—*Jl. Animal Ecology*, 1933. Nov. Vol. 2. No. 2. pp. 197-203.
 With 2 plates.

The author has developed a standard technique for counting *Glossina morsitans* on fly-rounds. He has applied this at regular intervals for

4½ years in a particular area in Tanganyika. He has also meteorological data for the same period, and a preliminary graphical examination has suggested that evaporation has more effect on numbers of fly than other meteorological factors. He now proceeds to examine the same question statistically.

In the present paper, the numerical data are examined by correlation coefficients which are used with exemplary caution. The period over which the data were collected included a time of unusual inundation, and it seems that this reduced the fly community so much that it required about 18 months to make a complete recovery. The author, therefore, presents correlation coefficients for the whole period under study (35-40 months in the case of most climatic elements) and also for the last 22 months, a period which was not affected by the flood. His general conclusions are that the negative correlation between fly and evaporation (or, saturation deficiency) is high and significant: that is to say, the drier the air, the lower the fly-count. There is, as might be expected, a considerable positive correlation with rainfall, for the rainfall produces a higher humidity, that is to say, a lower evaporation. But there is, unexpectedly, no significant correlation with temperature. It is also extremely interesting that there is a high and significant correlation between evaporation, saturation deficiency and rainfall and the fly-count of the succeeding month. This shows that the fly-count does give a measure of the number of flies and not only of their activity at the time when the count is made. It has, of course, always been assumed that this was the case, but we do not think that it has ever been proved in so conclusive a manner. Needless to say, it remains probable, indeed almost certain, that the fly-count is also influenced by the activity of the insects, so that it is not entirely a measure of numbers.

The author's approach to this difficult problem is new and cautious. It would surely be advantageous if similar work could be carried forward with more complete meteorological data. P. A. Buxton.

ZUCCARINI (J. A.) & OYARZABAL (J. D.). Sur l'existence du *Trypanosoma cruzi* à Cordoba (R.A.). [*T. cruzi* at Cordoba (Argentine).]—*Folia Biol.* Buenos Aires 1933. Oct.-Nov.-Dec. Nos. 31-32-33. p. 151. [Spanish version p. 146.]

In May last, whilst examining systematically for malaria parasites the blood of the inhabitants of La Canada in the south-west of Cordoba, the authors came across a case of infection with *Trypanosoma cruzi*, a child born in the district 8 months previously. Regular examinations of the blood up to the beginning of September always revealed small numbers of trypanosomes, and subinoculations of the blood into susceptible animals were positive. Apart from micropolyadenitis there was no symptom. The electrocardiogram was normal. W. Y.

GEOGHEGAN (Arnoldo J.). Dos nuevos casos de tripanosomosis humana americana en la prov. de Catamarca. [**Two More Cases of American Trypanosomiasis in Catamarca Province, Argentine.**]—*Folia Biol.* Buenos Aires. 1933. Oct.-Nov.-Dec. Nos. 31-32-33. pp. 147-148.

Two fresh cases here recorded brings the total seen by the author in Catamarca to five, four of them coming from the capital. Both these

now detailed were young children, one was 3½ months old, the other 8 months.

The first showed *Tr. cruzi* in the blood, but inoculation (a small quantity only, obtained by cupping, was available) into white rats was negative. Clinically the signs were a yellowish tinge on the face, some exophthalmos, enlargement of the submaxillary and cervical glands, distended abdomen, enlarged liver and spleen, oedema of face and ankles. The mother stated that the illness had begun two to three months before with fever, irritability and convulsions [? twitching] during sleep. No other members of the family showed trypanosomes in their blood. The patient could not be further observed as the family moved from the district. It is stated that the *Triatoma* was common in tree trunks, especially that of the black carob bean (*algar-roba negro*), but very exceptionally they were seen in the houses.

The second patient had trypanosomes in the blood and inoculation into a white rat proved positive. The child was slightly febrile (38°C.) and the attack had started 20 days previously with high evening temperature; the skin was yellowish, straw-coloured, and there was slight facial oedema, irritability and convulsions during sleep. When examined subsequently [how much later is not stated] the child appeared to be well and no trypanosomes could be seen in the peripheral blood.

H. H. S

DUNN (Lawrence H.). **A Natural Infection of *Trypanosoma cruzi* Chagas found in *Rhodnius pallescens* Barber in Panama.**—*Amer. Jl. Trop. Med.* 1933. Sept. Vol. 13 No. 5. pp. 471-473.

A recently described reduviid bug, *Rhodnius pallescens*, collected in a hut in a small village, Aguas Buenas, near Panama city, was found to be infected with *Trypanosoma cruzi*. Guinea-pigs on which the bugs were fed became infected, but so far no infection has yet been found in the members of the family occupying the hut, viz., 3 adults and 2 children. The author notes that the first case of Chagas' disease recognized in Panama was in a child living in a hut near Aguas Buenas, and a few months later, in 1931, three other children in the same village were found to be infected.

W. Y.

STEIN (L.). Chemotherapeutische Versuche bei der Chagaskrankheit (*Schizotrypanum cruzi*). [Chemotherapeutie Experiments in Chagas Disease.]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1933. Vol. 80. No. 1/2. pp. 1-15. [24 refs.]

Experiments were undertaken to ascertain whether certain compounds of bismuth and atabrin had any influence on *T. cruzi* infections in mice.

After giving a summary of previous attempts to find a cure for this infection, the author passes to a detailed account of his own work. The compounds used were:—R 141 (bismutho- α -dithiopyridin- γ -sodium carbonate); R 1220 (another compound prepared by Rothmann somewhat resembling R 141); Bismutho-yatren A (bismuthyl-7-iodo-8-oxychinolin-5-sodium sulphate); Bi 5 (Pallicid) i.e., tri-bismuthyltartrate; Bi-diasporal 360 (a radio active bismuth compound); and atabrin.

None of these compounds had any effect on the fully developed infection, but all the bismuth compounds except R 1220 prevented the

development of the infection when they were injected at the same time as the virus. Atebrin alone had no effect, but when given in combination with R 1220 produced a prolongation of the infection. W. Y.

MACLEAN (G). **Memorandum on Sleeping Sickness Measures.**—Tanganyika Territory Medical Department 6 pp 1933 Dar Es Salaam. Govt. Printer

— **Sleeping Sickness Notes.**—Tanganyika Territory Medical Department 7 pp 1933 Dar Es Salaam Govt. Printer.

These articles, which deal with sleeping sickness problems as met with in Tanganyika, are of a semi-popular nature and require no special notice.

W Y

ADVIER (M) & SCHENNBURG (P). Un cas de maladie du sommeil contractée par un Européen aux environs de Dakar — *Bull. Soc. Path. Exot.* 1933 June 14. Vol 26. No 6 pp 869-871

BIOLOGIE MÉDICALE 1933 Supplement to No 4 56 pp — Documentation clinique et expérimentale sur l'action trypanocide de l'Ossanine Sodique (1926-1932).

REVIEWS AND NOTICES.

CELLI (Angelo) [the late]. Edited and Enlarged by Anna CELLI-FRAENTZEL. **The History of Malaria in the Roman Campagna from Ancient Times.** With a Preface by Sir Aldo CASTELLANI, K.C.M.G. (Hon.), D.S.C., M.D., F.R.C.P.—pp. viii + 226. With 1 folding map. 1933. London: John Bale, Sons & Danielsson, Ltd., 83-91 Great Titchfield Street, W. 1. [10s. 6d.]

This is the story of the Campagna down the centuries, and of its rediscovery through the devotion of Angelo Celli as a land of promise for his countrymen. Professor Celli was engaged in writing a history of malaria in the Campagna at the time of his death, he had collected an immense amount of material for his subject and a debt of gratitude is due to Madame Celli who has arranged and edited it. The book is a literary museum of extracts and citations from Ovid, Strabo, Livy and Cato in classical times, from countless ecclesiastical and other documents in the middle ages, and from Shakespeare, Addison, Dickens and many others in modern times. Its main theses are, firstly, that the desolation of the Campagna was due neither to war nor to the rapacity of the great landowners, but to malaria, and, secondly, that prophylactic quinine is the magic weapon which has at last brought victory.

The Campagna has not always been malarious; the immense ruins of Etruscan cities testify to its healthiness in pre-Roman days, and during the early centuries of the Republic there was little malaria, but it became prevalent after the second Punic war, in about 200 B.C. It declined during the Empire, and, until the Sack of Rome by the Goths in 410 A.D., the villas of the Campagna maintained their splendour unimpaired. During the following centuries all attempts to colonize were ruined by malaria, and it was not until the Renaissance that the disease declined once more and the nobles of Rome built their palaces along the shores of Latium. This prosperity was destroyed by the Sack of Rome in 1527, and from that time until the end of the 19th Century the Campagna was a desert ruled by malaria.

When Italy became a united kingdom in 1870, Garibaldi believed that the papal régime was responsible for this desolation; the estates of the Church were confiscated, and from 1885 to 1890 vast drainage works were carried out by the State; but failure followed failure, all attempts to colonize were fruitless, and, in 1898 the work was abandoned. The situation was saved by Angelo Celli who discovered the road leading from the laboratory to the open country. He founded the Association for the Study of Malaria, and owing to its efforts the quinine laws were passed. Under these laws the State control of quinine was established, employers were held responsible for supplying it to their labourers, and free quinine was issued to the poor. In the 18th and 19th Centuries quinine was used only for the treatment of the sick, but, in recent years, it has been employed as a prophylactic, and, armed with it, the Italians are re-conquering the Campagna. Before an area is reclaimed a sanitary staff composed of 45 physicians assisted by trained nurses arrives, and, while the land is being drained, the health of the labourers is protected by quinine. As a result, the number of patients in the hospitals of Rome is lower than it has been for 20 centuries, and the coast of Latium, from Civitavecchia to Nettuno, has been transformed from a hotbed of malaria into a health resort.

W. Fletcher.

ESSED (W. F. R.). **Over den Oorsprong der Syphilis. Een Kritisch-Historisch-Epidemiologische Studie tevens ontwerp eener nieuwe Theorie.** [The Source of Syphilis. A Critical Historical Epidemiological Study together with a New Theory.]—pp vi.+328. With 3 figs. on 2 plates 1933. Amsterdam : H. J. Paris

Publications of recent years on tropical medicine have dealt with the question—*Is yaws syphilis?* In this book, however, an entirely new turn is given to the question by its transformation to—*Was syphilis yaws?* The epidemic of syphilis at the end of the 15th century, a highly contagious disease, spreading through country after country, has been responsible for much disputation on where the guilt of origin lay. In the author's opinion it was undoubtedly a "New Sickness" and he discusses in this closely reasoned, highly documented book the opinions of a great range of authorities. He thus introduces us to a wealth of historical information of a very interesting sort. We read in the first place how this new, deadly and decimating malady could be accounted for by the conjunction of Jupiter and Saturn in the sign of Scorpio. There arose then the two camps of disputants, the Scorpionists and the non-Scorpionists. Other fantastic explanations of the sickness, many of them based on the prevalent humoral theory, are also reviewed. The real subject matter of dispute, however, centres round the introduction into Europe of the disease from America after its discovery by Columbus. We are required to call ourselves Americanists or Antiquarians according as we uphold the doctrine of introduction of the disease to Europe by Spanish sailors and its infliction upon a virgin soil, or throw in our lot with the contestants for an exacerbation of an ancient, existing disease, well known to the Arabs, the Greeks and the Romans. The mummies of Egypt contribute their share to this side of the question. A variation in approach to the subject, which, however, is dismissed by the author as inconceivable, is that of BOERHAAVE, following SYDENHAM, who attributed the introduction of syphilis into the New World to the slave traffic from the African Gold Coast. The European epidemic of "syphilis," however, was at the end of the 15th century, whereas the first transport of slaves only took place in 1502.

We might linger at length on all sorts of curious information before relinquishing this historical disquisition. We might enter along with the author, into the merits of the names given to the New Sickness—the Spanish Disease, an allusion to the introduction by sailors from America, the *Morbus Gallicus* in agreement with the theory of its diffusion upon the disbandment of the army of Charles VIII of France in 1495, or the Italian disease which would represent its origin as essentially due to the war of Naples. In this war an army of mercenaries was engaged and was less intent upon soldiering than upon the opportunities for looting and much excess "*in baccho et venere*" We restrict ourselves, however, to one reference only, for its national interest. It is instructive to discover that, whereas at the present time the town of Edinburgh is agitating for parliamentary sanction to compulsory notification of syphilis, this sanction in a highly rigorous sense was already put into effect by the Scottish ruling authorities for the "New Disease" in the reign of James IV. All sufferers from the "Grandgor" were ordered to quit the town by a fixed date and betake themselves to Leith where they would find boats to convey them to the island, the Inch, on which they were to remain till well. Those who

failed to comply with this drastic quarantine regulation ran the risk of being branded on the cheek.

Up to the end of the first part of the book the author, although insistent on the conception of the disease being *new*, gives full weight to a consideration of the argument of the "Antiquarians" the protagonists for an *Alttertumssyphilis*. At this point he presents the reader with his mode of escape from the alternative of being an Americanist or a non-Americanist by maintaining that the epidemic syphilis, called the Spanish Pox, the Bubas, was not syphilis as we know it at the present time. The title of the second part of the book gives the author's point of view—The New Sickness which was brought to Europe, Africa and Asia after the discovery of America was not syphilis but yaws. The first chapter of the second part treats of the symptom complex of yaws and then follows a succession of chapters on the *Morbus Gallicus*. In the 7th chapter we find those arguments on which the author's theory rests taken up *seriatim* to the number of forty-one. Naturally this chapter deals extensively in its medical section with the differential diagnosis between yaws and syphilis. In the next chapter, which relates to the length of time during which the malady remained in Europe, the conclusion is reached that it lasted for two centuries after being brought over by Columbus. Yaws was still present in England at the beginning of the 19th century. The very last among the author's conclusions, to which we shall presently refer, is that the conception of "endemic syphilis" is incorrect and a special chapter is devoted to this aspect of the question. In this chapter we find that the "so-called endemic syphilis received different names in different countries." There were the radesyge of Norway and Sweden, the sivvens of Scotland, the button scurvy of Ireland, the "syphilis" of Canada, the scherlievo of Italy, the frenga of Servia and the spyrokolon of Greece. All of these appear to have been yaws. Nor does this view come unsupported. We have, for example, this quotation from an article by a Dr. James THOMSON from Jamaica in the *Edinburgh Medical Journal* of 1819—"I have by me the notes of an old practitioner of this island who went home to a part of Scotland where the sibbens was prevalent. His remarks are made without any allusion to theory and they tend to confirm the identity of yaws and sibbens in many particulars. . . ." Even in the 20th century yaws makes at least one dramatic reappearance in Europe, for during the great war two American soldiers, diagnosed as suffering from impetigo contagiosa, had this diagnosis changed to yaws at the instance of a Brazilian doctor.

A review such as this can scarcely do justice to the contents of a work of this kind, nor have we gone in detail into the points of difference between yaws and syphilis. The author's conclusions, briefly expressed, are that syphilis has always been present in Europe. It was not syphilis but a new disease, introduced by the sailors of Columbus, which spread as an epidemic at the end of the 15th century and this disease was yaws. The new disease ultimately became confused with syphilis and the two were classed together as one and the same venereal disease.

W. F. Harvey.

ROCKEFELLER FOUNDATION. *Annual Report 1932* [MASON (Max), President].—pp. viii+455. With 45 illustrations. New York: 49 West 49th Street.

In these difficult times, when the Governments, Universities and other Educational Institutions of nearly all countries find themselves

obliged to cut down expenses in any way that they can, scientific research is one of the first subjects to fall under the axe of retrenchment, it is therefore even more than usually welcome to learn from this Report that the manifold activities of the Rockefeller Foundation, during the year 1932, show no signs of diminution. As usual, the principal items of expenditure were for the promotion of research work both in the laboratory and in the field, work and education in Public Health, and Fellowships and Grants in Aid: the great power for good, exercised by the Foundation, is much enhanced by the continuity of policy which it is able to maintain.

The Report is of considerable scientific interest and practical value; there are sections on yellow fever, malaria, ankylostomiasis and other tropical diseases, on State and Local Health Services, on Public Health education and the training of nurses. Much information and many suggestive ideas can be gleaned from these summaries of the work done during the year.

Under yellow fever it is reported that it is evident, from the result of blood examinations, that widespread unrecognized epidemics have occurred in recent years in many parts of the interior and in the coastal areas of West Africa. In the section on malaria attention is drawn to the various local races of *Anopheles maculipennis*, the importance of which is now recognized. From the beginning of the work of the Rockefeller Sanitary Commission, in 1909, much attention was given to hookworm disease, and the Rockefeller Foundation carries on the work with the same vigour. In 1932 an epidemiological and bacteriological study was made of the common cold in an Arctic climate. It was found that, in a community of about 500 people in Spitzbergen, the incidence of the common cold is about one attack per person per year. An annual epidemic follows the arrival of the first ship in the summer, this epidemic lasts for about six weeks, and a few second attacks occur. Soon afterwards colds practically disappear, and only four cases were reported in the last three months before the next shipping season.

Demonstrations in Public Health subjects were given in eight European countries; field and laboratory research was continued, and much practical work was done. There was also much activity in this subject in North, Central and South America, in China, and other countries.

Large grants were made to various Institutions for the promotion of research in the fields of neurology and psychiatry.

The Report makes cheerful reading, and shows plainly how ably the large resources of the Rockefeller Foundation are administered by the Members and Executive Committees.

H. J. Walton.

SHATTUCK (George Cheever) [M.D., Assistant Professor of Tropical Medicine, Harvard University Medical School], in Collaboration with Others. **The Peninsula of Yucatan. Medical, Biological, Meteorological and Sociological Studies.**—pp. xvii + 576. With frontispiece, 68 plates & 30 text figs. Carnegie Institution of Washington Publication No. 431. 1933. Washington.

The first, second and third Yucatan Medical Expeditions which were in the field in 1929–1931 and the results of which appear in this handsome volume were organized at the instigation of the Carnegie Institute of Washington by the Department of Tropical Medicine of Harvard University, of which Professor Shattuck is a distinguished member. Their object was to make a survey of disease in the State

of Yucatan which, together with historical evidence of disease in the Peninsula, might throw light on the collapse of the Mayan civilization.

The results of each Expedition are recorded separately, so that the information is scattered, but the chief results of the first two Expeditions are summed up in Chapter 21.

Regarding the Pre-Columbian period it is thought that dependence upon local supplies of impounded water in this arid area must have meant a heavy mortality from intestinal affections. Tuberculosis was probably absent. During the "period of the Conquest," 1502 to 1697, yellow fever and smallpox, imported from Africa, must have decimated the Mayas; malignant tertian malaria was probably imported about the same time. In the modern period there was a devastating outbreak of cholera in 1833. The results of the present survey make it evident that dysentery and similar infectious diseases of the intestinal tract are responsible for about one-third of the deaths in the State. The greatest health problem is the supply of safe drinking water at low cost. The second place in the causes of death is taken by malaria or respiratory diseases. Of increasing importance in the future will be leprosy and tuberculosis. Syphilis appears to be almost negligible in its incidence. Trachoma may become a health problem in the future. The chicleros should be protected from chiclero ulcer, which in many cases is leishmanial.

The first two Expeditions took place in the winter or dry season. The third was in the summer, the rainy months, and was mainly for the purpose of studying the incidence of malaria and amoebic dysentery. In the malaria survey 2,353 patients were seen and 2,198 blood smears examined. Only 48 or 2.2 per cent. were positive. The prevailing parasite was *P. vivax*. As the author observes, this is almost negligible for a tropical country where malaria is endemic. In spite of frequent searches anophelines, either adult or larval, were never found. The transmitter is believed to be *A. albimanus*.

Examinations for amoebae were made in 1,362 stools from 854 persons; 166 or 19.5 per cent. were infected with *E. histolytica*. Since not more than 1.5 examinations per person were made the true incidence is estimated at 40 per cent., an incidence which on the basis of findings elsewhere is believed to be near the average for tropical countries. Active amoebic dysentery was noted in 28 persons or 3.3 per cent.

J. C. BEQUAERT writes on the entomology of Yucatan. Extreme arid conditions during the dry season and scarcity of permanent superficial water account for the small number of blood suckers. C. C. HOFFMANN has written on the Anopheles of Mexico [see this *Bulletin*, Vol. 29, p. 688], 6 species are reported from the Yucatan peninsula. Though Yucatan used to be an endemic centre of yellow fever *Aedes aegypti* does not occur anywhere in large numbers. The only really common domestic mosquito is *Culex quinquefasciatus*.

For reasons given it is thought that Dr. LARA's record of paragonimiasis in Yucatan [this *Bulletin*, Vol. 3, p. 287] is doubtful and should await confirmation. There is much else that is of interest in the volume, especially on the sociological and anthropological sides. The photographs are beyond praise.

A. G. B.

TROPICAL DISEASES BULLETIN.

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[No. 4.

KALA-AZAR.

NAPIER (L. Everard) & KRISHNAN (K V). **Kala-Azar in Madras and its Bearing on Epidemiology of the Disease in India.**—*Indian J Med Res* 1933. July Vol 21. No 1 pp. 155-172 With 2 charts & 1 map

The incidence of kala azar in Madras city as discussed in this paper is based on 3 surveys, covering the periods 1904-1911, 1913-1922 and 1923-1931, made by examination of the records of the large hospitals in the city. The conclusion is reached that in Madras the disease is truly endemic and is not subject to variations from year to year. In Assam, on the other hand, it is epidemic and disappears almost entirely from certain areas in the inter-epidemic periods. In Bengal there is an intermediate condition, kala azar being endemic more or less throughout the province but subject to periodic increases in incidence.

As regards endemic areas outside Madras city there is no evidence of change in incidence from year to year, the disease in some cases having been known for fifty years. Furthermore it is noted that this stationary condition has occurred in spite of treatment, so that it is obvious that kala azar in Madras cannot be controlled by treatment of cases alone.

It has been supposed that cases of post-kala azar dermal leishmaniasis were rare in Madras but the investigation has shown that they are actually more common than in Bengal. It thus appears that with increasing endemicity of the disease, which is dependent on a better adaptation of parasite to host, the dermal cases increase also. In this respect Bengal occupies an intermediate position between Assam and Madras. In Assam the authors' view is that the disease either kills the patient or is cured by the relatively rapid development of a complete immunity. In Bengal, the population having some general immunity as a result of repeated epidemics in the past, the disease is less severe, so that complete immunity is less frequently developed. Chronic cases become more frequent and these lead to the establishment of the parasites in the skin where in many individuals they appear to exist and multiply with the minimum of disturbance to the host. In Madras the condition of complete adaptation of host to parasite is still further approached, in the greater incidence of skin cases and the lack of fluctuations in the incidence of the disease. The skin condition

being once established, it is supposed that the transmission from man to man of parasites from the skin will more readily lead to skin infections than if the parasites transmitted were those in the blood which had come from the internal organs. In other words it is assumed that with long exposure to infection not only does the host change but the parasite also.

In an appendix to the paper the second author gives details of the survey made by him in 1932, in Madras city and villages outside this area. One interesting point is that in Kayalpatnam, a kala azar centre, *Phlebotomus argentipes* was captured for the first time. Its apparent absence in the past has been regarded by some as an argument against the theory of sandfly transmission. C. M. W.

SERGEANT (Edm.), SERGEANT (Et), PARROT (L.), DONATIEN (A.) & LESTOQUARD (F.). Revue historique du problème de la transmission des leishmanioses [Historical Review of the Problem of Transmission of the Leishmanial Infections].—*Bull. Soc. Path. Exot.* 1933. Feb. 8 & 9. Vol. 26. No. 2. pp. 224-248. [Refs. in footnotes.]

This is a valuable historical account of the observations and researches which have led to the incrimination of sandflies as the vectors of kala azar and oriental sore.

The first suspicions that these insects might be vectors of leishmania resulted from observations made by the brothers SERGEANT on oriental sore at Biskra in 1904. They went so far as to carry out a number of feeding experiments on themselves with these flies and recorded their results in 1905. Since then a vast amount of experimental work has been done in N. Africa, India, China, Palestine, Sicily, Malta and other places with the result that there is now a fairly general conviction that the transmitting host of the various leishmaniasis are sandflies of the genus *Phlebotomus*. The whole of this experimental work is reviewed in the article, which must be read in its entirety by those who wish to have an up-to-date knowledge of the subject. C. M. Wenyon.

ADLER (S.). Mode de transmission des protozoaires sanguicoles et particulièrement des leishmanioses. (Rapport introductif.) [Mode of Transmission of Blood Protozoa and Especially Leishmaniasis].—*Bull. Soc. Path. Exot.* 1933. Feb. 8 & 9. Vol. 26. No. 2. pp. 207-222. [35 refs.]

Adler here discusses the methods of transmission of blood protozoa and summarizes the results of a number of years of research into the method of transmission of leishmania infections.

In considering the transmission of the blood-inhabiting protozoa the author deals firstly with the Sporozoa, the blood forms of which appear to have been evolved from intestinal coccidia. The exact mechanism of transmission depends upon the type of development in the transmitting host. In the case of the haemogregarines the vertebrate becomes infected by eating the invertebrate in which development of sporozoites has taken place in its body cavity, while with the malarial parasites the more highly organized development in the invertebrate, leading to the infection of the salivary glands with

sporozoites, is associated with transmission by the bite. Similarly, with the haemoflagellates the exact method by which the invertebrate conveys infection to the vertebrate depends upon the site of development in the invertebrate. In the more primitive trypanosomes development leads to infection of the hind gut of the insect which passes on its infection to the vertebrate which devours it. A more specialized development in insects leads to infection of the proboscis or even the salivary glands with consequent transmission by the bite. Whether these vertebrate trypanosomes were originally parasites of insects or inhabitants of the intestine of vertebrates is a matter of opinion. The author favours the former view and considers that a purely insect parasite secondarily became adapted to life in the body of the vertebrate. It seems probable that certain intestinal leptomonas infections of lizards are acquired by the lizard eating infected insects. In certain lizards the leptomonads have acquired the property of invading the blood stream where they are exposed to ingestion by blood-sucking insects, such as sandflies, which in some cases are the actual transmitters of the infection. Some trypanosome infections of lizards are likewise conveyed by sandflies by these insects being eaten by the vertebrate.

The above considerations lead the author to the question of the relationship of sandflies to the various leishmania which develop in these insects. In the case of the leishmania of lizards one form in the sandfly develops in the hind gut while another adopts an anterior position. In the former case infection would be by ingestion of the sandfly while in the latter infection by the bite is a possibility. Similarly, in the case of the human leishmania though there is a tendency for some development to occur in all sandflies, it is much more marked in some than in others, while the degree of extension forwards towards the proboscis varies. Generally the parasite of visceral leishmaniasis is associated with sandflies of the *major* group—*Phlebotomus argentipes* in India, *P. chinensis* in N. China, *P. perniciosus* in Italy, Malta and Algeria, and *P. major* in Greece, while oriental sore occurs where *P. papatasi*, *P. sergenti* or *P. caucasicus* are found. It is in these species that the most active development occurs, but even amongst them there are considerable variations, all of which are dealt with by the author, who believes, for instance, that the marked tendency shown by *Leishmania infantum* to adopt an extreme anterior position in the sandfly is an indication that this parasite is transmitted by the actual bite, leading to the high percentage of infantile infections in the Mediterranean region, as also those of dogs. On the other hand the parasite of Indian kala azar does not extend forwards in *P. argentipes* to the same extent, so that infection by the bite is less likely to occur. Only adults, or at least those capable of crushing infected sandflies on the skin, are exposed to the danger of contracting the disease.

The above points are but a few of those dealt with. C. M. W.

NAPIER (L. Everard), SMITH (R. O. A.) & GUPTA (C. R. Das). The Infection of *Phlebotomus argentipes* from Dermal Leishmanial Lesions.—*Indian Jl. Med. Res.* 1933. July. Vol. 21. No. 1. pp. 173-177.

Cases of post-kala azar with skin lesions, even obscure, constitute a good source of infection for sandflies.

In 1928 SHORTT, D'SILVA & SWAMINATH showed that *Phlebotomus argentipes* became infected with leishmania when fed on a nodule in a case of post-kala azar dermal leishmaniasis [this *Bulletin*, Vol. 26, p. 325]. At about the same time this observation was repeated at Calcutta by "some of the writers," one of a batch of sandflies which had fed on a nodule being found infected. An attempt to infect sandflies from the depigmented lesions of the skin failed. A further attempt was made in 1932, the results of which are recorded in this paper. In this case the whole limb of a case showing depigmented patches was exposed to the bites of sandflies. The fed flies were not dissected at once but were re-fed one to three times on healthy mice in order to give time for the development of any parasites which might have been ingested. The flies were dissected as they died and gave a final percentage of 30 per cent. infected. The percentage found infected increased with the number of feeds. A further batch of 20 flies were fed on the arm of a woman with lesions so indistinct that they had been overlooked not only by a medical man who examined her but by the woman herself. Of these one became infected. It is also noted that a few years ago the first author examined wild sandflies in Calcutta for natural infection. The procedure of feeding the sandflies one or more times on clean mice before dissection was adopted. One of the sandflies was found infected. As a result of the experiments it is concluded that the cases with skin lesions are an abundant source of infection to sandflies and that this is not limited to cases with obvious lesions.

C. M. W.

NAPIER (L. Everard), SMITH (R. O. A.) & KRISHNAN (K. V.). **The Transmission of Kala-Azar to Hamsters by the Bite of the Sandfly *Phlebotomus argentipes*.**—*Indian Jl. Med. Res.* 1933. Oct. Vol. 21. No. 2. pp 299-304

In recording the successful transmission of kala azar to hamsters by the bites of infected *Phlebotomus argentipes*, the authors review the previous attempts, including the one successful effort of SHORTT, SMITH, SWAMINATH and KRISHNAN (this *Bulletin*, Vol. 29, p. 107), wherein one hamster fed upon by infected sandflies was found infected on the 511th day after the commencement of the experiment.

The present experiment involved 28 hamsters which fell into three groups. In one group of 11 the average number of infected flies fed on each was estimated at 39. The animals were killed between the 419th and 629th days of the experiment. One animal killed on the 419th day was infected. A liver puncture on one on the 435th day yielded what appeared to be a single typical parasite, but when killed on the 583rd day it showed no infection. The first result may indicate that the animal was recovering from a transitory infection. In a second group of 9 hamsters the average number of infected flies fed on each was probably 33. In one animal, which died on the 482nd day, a heavy infection was found. In the third group occurred 8 hamsters. As regards the number of infected flies and the duration of the experiment the figures are much below those of the other groups. No infections resulted. It is noteworthy that where positive results were obtained the feedings were carried out during a period of high atmospheric humidity, while the animals survived over 400 days.

C. M. W.

NAPIER (L. Everard), SMITH (R. O. A.) & KRISHNAN (K. V.) **The Relative Infectivity of the Two Forms of *Leishmania donovani* administered by Different Routes.**—*Indian Jl. Med. Res.* 1933. Oct. Vol. 21. No. 2. pp. 305–314.

The two forms referred to in the title are the flagellate culture form and the round tissue form from infected organs of hamsters, and both were administered to Chinese hamsters by five different routes, namely intraperitoneally, subcutaneously, orally, percutaneously and conjunctivally. A high percentage of infections was produced by both forms of the parasite by all routes. Except by the conjunctival route the flagellate form was always the more infective, while for the various routes the infection rate was in the order given above. Of 89 animals used for the flagellate infections 73 were proved to have acquired infection, while of the 63 in the leishmania series 45 became infected. The infection rate is higher than that obtained by other workers, but this is accounted for by the fact that the animals were kept longer before examination, while the culture method was used to aid diagnosis of infection
C. M. W.

GIRAUD (Paul) & CABASSU (Henri). Le chien est-il le réservoir de virus de la leishmaniose interne [Is the Dog a Reservoir of K.A. ?]—*Arch. Méd. Gén. et Colon* 1933. Jan. Vol. 2. No. 1. pp. 23–27.

Owing to the frequent occurrence of leishmania in the skin of dogs suffering from kala azar in and around Marseilles the authors are led to suggest that this is due to the repeated wounding of the skin by ticks infected with leishmania. Similarly they think that the dermal infections seen in some human cases in India may also be due to repeated skin inoculations by infected insects. As regards the Mediterranean disease they believe that the banishing of dogs from the neighbourhood of children and the careful destruction of ticks which they have left behind in the gardens will at least check the disturbing extension of the human disease which has taken place. Unfortunately, no experimental evidence is produced to prove that the dog tick is capable of spreading the infection.
C. M. W.

PARROT (L.), DONATIEN (A.) & LESTOQUARD (F.). Notes et réflexions sur la biologie de *Phlebotomus perniciosus* Newstead en Algérie. [Biology of *P. perniciosus* in Algeria.]—*Arch. Inst. Pasteur d'Algérie*. 1933. June Vol. 11. No. 2. pp. 183–191. With 1 fig. [20 refs.]

These notes refer to the distribution, incidence and habits of *Phlebotomus perniciosus* in Algeria, all of which afford arguments in favour of this sandfly being regarded as the vector of kala azar.

It has already been shown by the authors (1930) that it became infected with leptomonad flagellates after feeding on cases of canine kala azar. An interesting point regarding the larvae is that breeding experiments have shown that they develop quite well in the laboratory after hatching from eggs laid by captured females when given no other food than dry leaves of the tree *Ulmus campestris*. The development from the egg to the fly at a temperature of 22°C.–24°C. occupies 134 to 216 days. This habit of the larvae of feeding satisfactorily on leaves agrees with the observation that the sandflies are associated with

vegetation NAPIER has stated that in Calcutta kala azar appears to be associated with the presence of vegetation which indicates a plant-feeding insect or vector.

C. M. W.

NATTAN-LARRIER (L.) & GRIMARD-RICHARD (L.). Une méthode de diagnostic de la leishmaniose viscérale. [**Method of Diagnosis of K.A.**].—C. R. Soc. Biol. 1933. Vol. 113. No. 28 pp. 1489-1492.

The authors describe a new serological test for leishmania infections.

It is based on the fact that alexine is adsorbed by a mixture of the serum from a case of leishmania infection and the serum of a rabbit which has been immunized with cultures of *Leishmania donovani*. The rabbit serum is prepared by injecting a rabbit intravenously with a culture every 6 days till 6 injections have been given. The blood is abstracted 15 days after the last injection, defibrinated and centrifuged, the resulting serum being placed in ampoules which are kept in the ice chest. The test is carried out in two ways. In the first 0.1 cc. of alexine, 0.1 cc. of the suspected inactivated leishmania serum, decreasing quantities (one-tenth to one hundred millionth of 1 cc.) of the rabbit serum (inactivated if fresh) and 0.2 cc of physiological saline solution are mixed in tubes and kept at a temperature of 37°C. for 1½ hours. To each tube are then added 0.1 cc. of antiserum and 0.1 cc of 5 per cent. suspension of sheep corpuscles. The tubes are then kept at 37°C. for ½ hour. If the suspected serum was actually from a case of leishmania infection haemolysis does not occur owing to fixation of the alexine. In the second way of making the test the suspected serum is present in decreasing quantities the other ingredients being uniform.

The two methods give good results but the second is preferable if small quantities only of suspected serum are available. Positive results have been obtained with one human and six canine cases of kala azar and with mice suffering from *Leishmania tropica* infection of the tail. The authors think that because of its simplicity the test will be of practical use in the diagnosis of kala azar. Previous tests based on fixation of the complement had to rely on leishmania antigens which were not only difficult to prepare but were unstable. In the present case the rabbit serum is easily made and can be easily stored. The quantity of suspected serum required for the first method is 1 cc. and that for the second only a fifth of this. Furthermore the test may be carried out even when the sample of suspected serum is not in the best condition of preservation.

C. M. W.

MUDALIYAR (M. R. Guruswami), SUNDARAM (S. K.) & RAMACHANDRAN (A. S.). An Investigation on the Diagnostic Value of Serum Protein Changes in Kala-Azar.—*Indian J. Med. Res.* 1933. Oct. Vol. 21. No. 2. pp. 361-378. [13 refs.]

It has already been noted that certain serum changes occur in kala azar in the direction of an increase in the total globulin at the expense of the albumin. At the same time the globulin shows an increase in the proportion of euglobulin to pseudoglobulin. It has been shown by LLOYD and his co-workers that with the progress in cure of kala azar the serum returns progressively to normal [this *Bulletin*, Vol. 26, p. 744]. The authors of the present paper have examined the serum

of kala azar cases and those of other diseases with a view to determining the diagnostic value in kala azar of the protein changes. They record their results in a series of tables and conclude that though no absolute diagnosis can be based on the changes these are of definite help in certain obscure cases C. M. W.

GIRAUD (P.), MONTUS & CIAUDO. Valeur de la réaction de Chopra à l'uréastibamine pour le diagnostic de la leishmaniose interne. [Value of Chopra's Urea Stibamine Reaction for Diagnosis of K.A.]—*Bull. Soc. Path. Exot.* 1933. Nov. 8. Vol. 26. No. 9 pp. 1156-1160. With 1 fig.

Having tested the value of the formol-gel reaction and the urea stibamine reaction in cases of infantile and canine kala azar the authors find that the one is as good as the other, though both are unreliable to the extent that a diagnosis of kala azar cannot be made by them alone.

As regards the urea stibamine reaction a positive obtained with a dilution of one in ten, as advocated by CHOPRA, is of little value. With dilutions of one in 1,000 there is considerable specificity but not more so than the easily carried out formol-gel reaction. It is evident that a more specific serological test is required if it is to replace the search for parasites as a means of diagnosis. In a discussion other speakers agreed that a one in ten solution of urea stibamine was too concentrated for the results given with it to be reliable. C. M. W.

KASSIRSKY (J. A.). Einige Bemerkungen zur Methodik der Knochenmarkpunktion bei der viszerale Leishmaniose und die heilprophylaktische Bedeutung dieser Methodik. [Bone Marrow Puncture in K.A. and its Significance for Treatment.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. Nov. Vol. 37. No. 11. pp. 496-499. With 1 fig.

Having carried out puncture of the sternum in order to obtain bone marrow for the diagnosis of kala azar in over 60 cases in Tashkent the author advocates the method as being preferable to others, especially in children. He describes the operation as being as simple as finger puncture for the preparation of blood films. The instrument used is a hypodermic needle 1 to 1.5 mm. in diameter, provided with a collar which can be fixed at any desired distance from the point by a screw. This distance varies from 0.5 to 0.8 cm. according to the development of the patient. It is claimed that by this method a diagnosis as early as the third or fourth week of the disease can be made. C. M. W.

RAYNAL (J.) & LE GAC (P.). Leishmaniose viscérale infantile et phlébotomes à Marseille. [Infantile Kala Azar and Phlebotomus at Marseilles.]—*Bull. Soc. Path. Exot.* 1933. Feb. 8 & 9. Vol. 26. No. 2. pp. 249-251.

Attention has recently been drawn to the frequency of infantile kala azar in the south-east of France. In Marseilles it is progressing from year to year, though limited to the suburban littoral districts. Studying the sandflies in Marseilles the authors have found three species, *Phlebotomus perniciosus*, *P. papatasi* and *P. larrousei*, the first named constituting 97 per cent. of the captures. Not only is this species most numerous in the total catches but its density is greatest in

the very places in which infantile kala azar is endemic. It would seem that, as demonstrated by ADLER and THEODOR in Sicily, this sandfly is the vector in Marseilles. C. M. W.

- D'OELSNITZ & CARCOPINO (E.). Un cas de kala-azar autochtone de l'adulte avec production d'ascite au cours du traitement stibié. Guérison par l'urée stibamine [Case of K.A. in which Ascites appeared in the course of Antimony Treatment. Cure by Urea Stibamine].—*Bull. et Mém. Soc. Méd. Hôpt. de Paris* 1933 Nov. 6. 3rd Ser. 49th Year. No 26. pp. 1165–1170.
- & ——. Effets favorables de l'urée stibamine dans le traitement des formes stibio-résistantes du kala-azar —*Ibid.* pp. 1171–1174

Urea stibamine was found of great value, especially in cases which had proved resistant to other forms of antimony.

The first paper describes a case of kala azar in an adult 24 years of age, the disease having been contracted in the South of France. Treatment with neostibosan, though reducing the temperature, did not improve the general condition, for there developed oedema and ascites estimated at 4 or 5 litres of fluid. Urea stibamine was then tried. There followed immediate improvement which was continued to the disappearance of all subjective symptoms and a return of the general appearance to the normal. The spleen, however, remained tender and slightly enlarged and the blood gave a positive formol-gel and antimony reaction while its albumin and globulin ratio had not become readjusted. The authors note that the persistence of these abnormalities is no indication that a cure has not taken place.

In the second paper four cases of kala azar are mentioned to illustrate the value of urea stibamine in the treatment of the disease. It is of special value in cases which have proved resistant to other antimony compounds. The authors find that the only drawback to its use is the difficulty of obtaining it in France. C. M. W.

- MÜHLENS (P.). Ein Fall von Kala-Azar an Bord eines deutschen Schiffes. [Case of K.A. on Board Ship].—*Deut. Med. Woch.* 1933. Oct. 20. Vol. 59. No. 42 pp. 1599–1601. With 4 figs.

The description of a case of kala azar in a seaman 38 years of age. Fever from which the patient suffered was at first thought to be due to malaria as subtertian parasites were discovered in the blood on two occasions. The infection, probably acquired in the Mediterranean region, was eradicated by a course of neostibosan. C. M. W.

- NAPIER (L. Everard) & SHARMA (L. R.). The Anaemia of Kala-Azar. —*Indian Med. Gaz.* 1933. Oct. Vol. 68. No. 10. pp. 545–554. With 10 figs. & 1 coloured plate.

A detailed study of the anaemia of kala azar has led the authors to the conclusion that it is caused by increased erythrolysis which may be the direct result of the general increase in the tissue and blood histiocytes, which is the characteristic reaction to the leishmania infection. A very striking feature of this anaemia is that no attempt to repair deficiency will produce any improvement. This can only be brought about by specific drugs which may act by paralysing the newly formed reticulo-endothelial cells, thus leading not only to their death and that of the contained parasites but to the immediate cessation by

them of the excessive phagocytosis of red cells. Correlated with this was the rapid fall in the reticulocyte count which was continued till only 0.6 per cent or even less were present, when the patient left the hospital. The many aspects of the case presented are discussed in detail in the paper, which must be read in full by those interested.

C. M. W.

KRISHNAN (K. V.), LAL (Chiranjī) & NAPIER (L. Everard). **Cytological Studies of the Blood and Tissues in Kala-Azar and Associated Conditions. Part IV. The Large Mononuclear Cells in Monkey Malaria.**—*Indian Med. Gaz.* 1933. Feb. Vol. 68. No. 2. pp. 66-74. With 5 charts & 1 coloured plate.

NAPIER (L. Everard), KRISHNAN (K. V.) & LAL (Chiranjī). **Cytological Studies of the Blood and Tissues in Kala-Azar and Associated Conditions. Part V. The Large Mononuclear Cells in the Peripheral and in the Spleen Blood in Kala-Azar.**—*Ibid.* No. 2 pp. 75-80. With 1 coloured plate.

A summary of the first paper has appeared in the Malaria Section [*ante*, p. 181].

In the second paper the study has been extended to the blood and tissues in kala azar. The characteristic histological reaction is a marked increase of histiocytes at the various foci of infection, particularly in the spleen. There is also an increase in the number of these cells in the blood of the sinusoids of the spleen. Some of these find their way into the general blood stream while the smallest reach the peripheral circulation. The immediate effect of treatment is to reduce the focal aggregates of these cells which, in want of evidence to the contrary, are assumed to be destroyed *in situ*. At the same time there is an increase of monocytes in the blood and spleen. It appears therefore that the characteristic reaction to leishmania infection is histiocytosis and that a successful immunity response is evidenced by a monocytosis. The increase of monocytes, themselves not actively phagocytic, is associated with a specific humoral reaction. As there is no destruction of leishmania in the histiocytes the increase in the number of these cells is due probably to a non-specific reaction to the presence of foreign bodies in the shape of the parasites. It is suggested that the proliferation of histiocytes which occurs in malaria might tend to scatter through the body localized leishmania infections. It is known that the histiocyte destroys malarial parasites by phagocytosis so that an explanation of the fact that malarial parasites are rarely found in the blood of kala azar cases, though they may appear there after cure of the leishmania infection, may be found in the great increase in these phagocytic cells in kala azar. The monocytosis in kala azar will not in itself check the malarial infection, for a successful immunity requires also a specific humoral substance in addition.

C. M. W.

SMITH (R. O. A.). **Cancerum Oris in a Monkey infected with *Leishmania donovani*.**—*Indian Med. Gaz.* 1933. Aug. Vol. 68. No. 8. p. 455. With 1 fig.

KRISHNAN (K. V.). **"Vincent's Disease" in a *Macaca irus* Monkey.**—*Ibid.* pp. 455-456. With 1 fig.

Four months after the subcutaneous inoculation into the arm of a monkey of *Leishmania donovani* in spleen and liver emulsions of an

infected hamster the animal suddenly developed a swelling of the cheek which next day had broken down exposing the bones. It was killed and was found to have a heavy leishmania infection of the liver and spleen. It appears that cancrum oris has not previously been noted in monkeys
C. M. W.

RIVERA (J.). Segunda nota sobre leishmaniosis canina en Madrid. [Canine Leishmaniasis in Madrid.]—*Trabajos*. Madrid 1933. June 15. Vol. 2 No. 15. pp. 39-40.

RIVERA BANDRES (Julio) La leishmaniosis canina en Madrid y sus relaciones con la endemia de kala-azar infantil—*Medicina Paises Cálidos*. Madrid. 1933 Sept Vol 6 No. 5. pp. 373-398. With 10 figs [131 refs.]

These two papers deal with the same subject, namely the search for cases of canine kala azar in Madrid.

It has already been reported by the author [this *Bulletin*, Vol. 30, p. 754] that he had found 11 cases of leishmania infection of dogs in 200 examined. Of these it now appears 8 were cases of visceral infection and 3 of muco-cutaneous infection. It is now reported that a further 250 dogs have been examined yielding 14 visceral and 4 skin cases. In the longer paper, which is a thesis for a doctorate, the whole subject of canine kala azar is discussed in detail with special reference to the conditions maintaining in Madrid. Very little new information regarding the canine disease is, however, contained in it.

C. M. W.

MAYER (M.), LAAS (E.) & SONNENSCHNEIN (C.). Ueber generalisierte Infektionen mit *Leishmania tropica* (Orientbeule) bei weissen Mäusen. [Generalized Infection with *L. tropica* in White Mice.]—*Arch. f. Schiffs- u. Trop-Hyg.* 1934. Jan. Vol. 38. No. 1. pp. 16-28. With 5 figs. [15 refs.]

With cultures of a strain of *Leishmania tropica* of Tunisian origin the authors produced infection in the skin of the tail of mice. Once established in mice the infection was readily sub-inoculated from tail to tail. Up to the 4th passage only local lesions in the tail were produced but at this one of two mice inoculated in the tail as usual developed a generalized infection with numerous parasites in the liver and spleen. After this change in the character of the infection, intraperitoneal inoculation of emulsions of the organs to other mice produced generalized infections associated in many cases with a sero-sanguineous exudate in the peritoneal cavity. Parasites were not seen in the exudate but were present, for a culture was obtained from the fluid. Parasites from the organs inoculated into the skin of the tail produced again a local infection.

A histological examination of the animals with generalized infection showed that the type of infection differed from that seen in kala azar, for there was often a heavy infection of the peritoneum, infected macrophages, either isolated or in groups, occurring throughout the fatty connective tissue. In the liver there occurred numerous nodules composed of masses of infected cells. Similar nodules, though less marked, were found in the spleen, bone marrow, suprarenals, lungs and other organs.
C. M. W.

RIOU (M.) & ADVIER (M.). Leishmaniose cutanée contractée au Sénégal. [**Dermal Leishmaniasis contracted in Senegal.**—*Bull. Soc. Path. Exot* 1933 Feb 8 & 9 Vol 26. No 2. pp. 254–256.

The paper records a case of cutaneous leishmaniasis, in the form of an ulcer on the right wrist, in a man who had lived only in Dakar, Saint-Louis and Joal in Senegal. The disease was without doubt contracted at Joal. Though both LAFONT and HECKENROTH in 1915 and Marcel LEGER in 1922 have recorded canine kala azar in dogs in Dakar, the case recorded is the first of its kind in human beings of this district.
C. M. W.

LAL (Sangham) & DOGRA (J. B.). **Spread of Cutaneous Leishmaniasis along Lymphatics.**—*Indran Med. Gaz.* 1933. Nov. Vol. 68. No. 11. p 628 With 1 fig.

A sepoy aged 19 contracted oriental sore on the middle finger of the left hand and also on the back of the right thigh. During the course of the disease nodules appeared on the back of the hand and finally along the arm. These followed the course of the lymphatics to which they were connected. Similar nodules appeared round the ulcer on the thigh. The case is recorded as illustrating the mode of spread of the infection.
C. M. W.

MANAI (Andrea). Contributo allo studio delle associazioni morbose. Nota Ia Sui rapporti tra malaria e leishmaniosi (**Contribution to the Study of Morbid Associations. On the Relations between Malaria and Leishmaniasis.**)—*Riv. di Malarologia* 1932. Sept.–Oct. Vol. 11. No 5 pp. 584–609 English summary (6 lines) p. 750

A detailed study of three cases of kala azar in Sardinia in persons who gave previous histories of malaria appears to indicate that though the leishmania infection is antagonistic to malaria, it nevertheless tends to be particularly severe in such cases
C. M. W.

PIERI (J.) & LENA (D). Leishmaniose infantile Sur un cas observé en Corse [**Case of Infantile K.A. in Corsica.**—*Bull. et Mém. Soc. Méd. Hôpt. de Paris.* 1933. Dec. 4. 49th Year. 3rd. Ser. No. 30. pp. 1402–1404

The record of a case of kala azar in a child three years old from Calvi in Corsica. It is also noted that of 16 dogs from Bastia and its environs examined by M. Ch. JOYEUX one was found to show leishmania in the spleen and bone marrow.
C. M. W.

LÖRINCZ (F.) & SZENTKIRÁLYI (Zs). Ueber das Vorkommen von *Phlebotomus macedonicus* (Adler und Theodor, 1931) in Ungarn. (Untersuchungen ueber Hunde-Kala-azar) [**Occurrence of *P. macedonicus* in Hungary.**—*Arch. f. Schiffs- u. Trop.-Hyg* 1933. Oct. Vol. 37. No 10 pp. 458–464 With 7 figs

The authors record the occurrence in Hungary of the sandfly named in the title. Though it has been suspected to be a vector of kala azar in Greece by ADLER & THEODOR the authors have not been able to obtain any evidence of the existence of human or canine leishmaniasis in their own country.
C. M. W.

JEHL (E. P) & BRISSY (G) Note sur l'existence du bouton d'Orient dans la région de l'Oued Rirh (Sud constantinois) [**Oriental Sore in the Oued Rirh Region.**].—*Arch Inst Pasteur d'Algérie*. 1931 June Vol. 9. No. 2. p. 374

It has been considered anomalous that oriental sore was absent from the district of Algeria mentioned in the title of the paper though present in neighbouring districts. The discovery of the disease in a boy 12 years of age who had never left the village of Mr'aier has removed this anomaly.

C. M. W.

COSTANTINO (Saverio) Leishmaniosi cutanea e reazioni sierologiche per la sifilide—Loro comportamento [**Dermal Leishmaniasis and Serological Reactions in Syphilis.**].—*Riv Sanitaria Siciliana* 1933 Sept. 15 Vol 21 No 18 pp. 1400-1403 English summary (4 lines).

Testing the Wassermann and Meinicke reactions in 9 cases of oriental sore, the author is able to state that the value of these from the point of view of the diagnosis of syphilis is uninfluenced by the other infection.

C. M. W.

THE TYPHUS GROUP OF FEVERS.

ERNSTENE (A. Carlton) & RISEMAN (Joseph E. F.). **Endemic Typhus Fever in Boston. A Report of Ten Cases.**—*New England Jl of Med.* 1933 Sept 14. Vol 209 No 11. pp. 542-545. With 1 fig. [12 refs.]

Ten cases of endemic typhus fever were observed at the Beth Israel Hospital in Boston in the four years from 1929 to 1932.

The disease corresponded in all essential details with the condition originally described by BRILL. In no instance did it affect more than one individual in a household and all had lived in the United States for many years. Six of the ten cases occurred during the warmer months of the year. A positive Weil-Felix reaction was obtained with the serum of 8 patients.

D Harvey.

GRENCI (Emilio) Tifus exantemático. Forma endémica de Córdoba. [**Endemic Typhus in Córdoba.**]—*Prensa Méd. Argentina.* 1933. Nov 15 Vol 20 No. 46 pp. 2402-2408. With 2 charts. [14 refs.]

The author describes in clinical detail, with an account of the serological reactions, two cases of typhus, to show that the disease is endemic in Córdoba.

The serum of one gave a positive Weil-Felix reaction in a dilution of 1 in 3,200, the other in 1 in 5,120. The author believes that cases are far from rare. Clinically, the onset was abrupt, the fever lasted for 2½ weeks in one patient, longer in the second because a phlebitis set in, ending in a rapid lysis with speedy recovery of health. At the height of the illness there was stupor with a certain amount of pulmonary congestion and bronchitis and enlargement of liver and spleen. The rat is thought to be the reservoir host and to convey the infection by its fleas.

From a consideration of the subject the author states [we think wisely] that there is no fundamental difference to warrant the regarding of these conditions as new entities, and that the points of dissimilarity may find explanation in differences of race, climate, season, general sanitation, the receptors and transmitters of the virus, "factors which are capable of modifying the virulence and changing the clinical picture without thereby affecting the true specificity" of the infection.

H. H. S.

ZINSSER (Hans) **Recent Advances in the Study of Typhus Fever.**—*Trans. College of Physicians of Philadelphia.* 1933. 4th Ser. Vol. 1. No. 1. pp. 1-15. [30 refs.]

This very able review of recent advances in the study of typhus fever is made up largely from papers that have already been published and summarized in this *Bulletin*.

The author is convinced that the Mooser bodies in the tunica of infected guineapigs are true Rickettsia and very closely allied although not identical with *Rickettsia prowazeki*. Nine facts are cited on which this opinion is based and one of these is new and has not so far been published.

Employing the method used by GOODPASTURE for the cultivation of filterable viruses on the living embryonic membranes of fertilized hens' eggs, the author obtained typical intracellular Rickettsiae in eggs inoculated with Mexican virus tunica material and in eggs

inoculated with spleen from a European typhus guinea-pig. In position, staining and morphology the observed organisms were identical. Guinea-pig inoculation from parts of these egg membranes in each case gave rise to the disease which had furnished the egg inoculum; in the one case fever only with abundant typhus lesions in the brain, in the other fever and scrotal reaction and scanty lesions in the brain.

It is also of interest to note that in smears from the piece of spleen utilized for the inoculum no *Rickettsia* could be seen, yet these rapidly developed in the cells of the egg membrane after inoculation. D. H

AFANASSIEWA (A.) & TRETJAK. Ueber Flecktyphusvirus-träger. [Typhus Carriers.]—*Zent. f. Bakt.* I. Abt. Orig. 1933. Nov. 1. Vol. 130. No. 1/2 pp. 123–128. With 7 figs. [Summary appears also in *Bulletin of Hygiene*]

In an attempt to estimate the frequency of symptomless typhus among children, the authors have carried out repeated agglutination tests on the inmates of two homes, each housing 65 children aged between nine and sixteen years. Their results, they think, indicate that symptomless infections and virus-carriers are frequent among children in an infected community.

In one home a few cases of typhus fever occurred during the investigation, in the other none. The culture employed for the tests was a strain of *Proteus X19*. The authors note that, in the three cases of clinical typhus examined, H agglutination was obtained to high titre, while in the apparently healthy children, with whom this report is mainly concerned, the agglutination was always of the O type.

Among the children in the home in which typhus infection existed, 17 gave negative Weil-Felix reactions throughout, 7 children gave agglutination at low dilutions (1:50 to 1:100) but showed no rise in titre, 16 children gave, on first examination, agglutination at a serum dilution of 1:50 to 1:400 and showed a marked rise in titre during the following ten to fourteen days, 22 children showed an initial low titre (1:50) rising to 1:800 or thereabouts during the following one to one-and-a-half months. The authors regard the two first groups as uninfected, the third as suffering from an ephemeral typhus infection, and the fourth as comprising cases of symptomless infection, or virus carrying.

Among the 65 children in the home in which no clinical case of typhus occurred, 50 gave entirely negative reactions, and 15 gave agglutination at low serum dilutions with no subsequent rise in titre.

Blood was obtained from eight of the children in the fourth group in the infected home, and with these samples sixteen guinea-pigs were infected. Fourteen showed the characteristic febrile reaction of experimental typhus; in the remaining two the reaction was doubtful.

W. W. C. Topley.

KUTEISCHIKOW (A.), DOSSER (E. M.) & BERNHOFF (F. G.). Der experimentelle symptomlose Flecktyphus beim gesunden und unempfänglichen Menschen. [Inapparent Typhus in Healthy Insusceptible People.]—*Zent. f. Bakt.* I. Abt. Orig. 1933. Aug. 15. Vol. 129. No. 3/4. pp. 262–265.

These three observers in Moscow had all suffered from typhus in the big epidemic of 1920–21. In 1930 they tested their sera and

found that the Weil-Felix reaction was negative in a dilution of 1/20.

Lice taken from a typical case of typhus fever were allowed to feed on all three observers on 23/2/30 and daily for one week; some of the lice were killed and examined and numerous *Rickettsia* were found in the cells lining the intestine. Four days after the first feed the Weil-Felix reaction became positive in a dilution of 1/30 and 1/50, on the 13th day in the case of Dr. Dosser the reaction was positive in a dilution of 1/200. Blood was taken from a vein on this day and injected into two guineapigs; both reacted with fever after an incubation period of 8 days and the virus was passaged in a series of animals, typical typhus lesions were demonstrated in the brains of those killed for examination.

None of the three experimenters showed any symptoms of illness. The authors are of opinion that such virus carriers as Dr. Dosser (inapparent infection in partially immune persons) may account for the carrying over of the virus during the inter-epidemic periods. Normal lice fed on observers did not cause any rise in the Weil-Felix reaction.

D. H.

KLEEBERG (J) **The First Case of "Exanthematic Fever" observed in Palestine.**—*Folia Medicinæ Internæ Orientalia* Jerusalem. 1933. May Vol 1 No 2 pp 235-236

A mild case of fever with profuse macular rash on the trunk but not on the face. The Widal reaction was negative as was the Weil-Felix reaction; no tache noire was noted

D. H.

LÉPINE (P). **Recherches sur le typhus exanthématique et sur son origine murine. Premier mémoire: Sur l'existence d'un typhus murin dans le bassin oriental de la Méditerranée et sur les caractères de ce virus. [Rat Typhus in the Eastern Basin of the Mediterranean: Characters of the Virus.]**—*Ann. Inst. Pasteur*. 1933. Sept. Vol. 51. No. 3 pp. 290-376. With 16 text figs [80 refs.]

This comprehensive review of the subject of rat typhus virus comprises the substance of a number of papers by Professor Lépine which have already been published and summarized in this *Bulletin*.

Conclusions.—1. A virus which can be passaged in guineapigs is found with great frequency in the brains of wild rats in the Eastern Mediterranean area. The natural disease in the wild rats waxes and wanes and is mild in the black rat.

2. The rat virus of Athens presents characters analogous to the typhus virus both *in vitro* and *in vivo*.

3. The rat virus is easily and rapidly destroyed by heat by drying and by antiseptics, and remains alive only a short time in glycerine; on the other hand it is resistant to cold; it passes a Chamberland L2 filter but is held back by Chamberland L3.

4. Guineapigs inoculated with this virus develop fever and later a scrotal reaction similar to that produced by Mexican typhus virus. *Rickettsia* can be demonstrated in smears from the tunica.

5. Rats inoculated with the virus develop a severe fever often fatal, in contrast to the inapparent infection produced by the virus of epidemic typhus.

6. Sometimes passage through guineapigs causes the loss of these characteristic features and it may be difficult to distinguish between the rat virus and typhus virus (epidemic).

7. Monkeys inoculated with the rat virus develop a severe fever and a positive Weil-Felix reaction appears in the blood serum.

8. The spermophile of Macedonia is susceptible to the rat virus and to typhus virus but does not show the scrotal reaction.

9. Mice and rabbits are also susceptible

10. The virus persists in the brain of rats and mice for considerable periods after the fever has ceased. D. H.

NICOLLE (Charles) & GIROUD (Paul). L'existence du typhus murin chez les rats de la région parisienne est encore à démontrer. [**Typhus Virus in Parisian Rats not yet Demonstrated.**]*—Bull. Acad. Méd.* 1933 Dec. 19. 97th Year. 3rd Ser. Vol. 110. No. 41. pp. 737-738.

The authors do not consider that Professor BRUMPT [see this *Bulletin*, Vol. 29, p. 773] has definitely proved that the rat typhus virus is present in the rats of Paris since in his investigation the virus was not passaged in guineapigs, Rickettsia bodies were not demonstrated in smears from the tunica of any of the animals, nor were they tested for immunity to typhus virus. Of 156 rats caught in various districts of Paris and the suburbs brain emulsion was injected by the authors intraperitoneally into 64 guineapigs; 35 of these showed no reactions but 29 had fever and some died, and several developed orchitis, subinoculation of the brains of these animals into other guineapigs gave no results. Eighteen of the original guineapigs which had been injected with the brains of the rats and *had not* reacted were tested by injection of a Mexican rat typhus virus; all reacted. D. H.

BRUMPT (E.). Le typhus des surniulots de Paris [**Rat Typhus in Paris.**]*—Bull. Acad. Méd.* 1933. Dec. 26. 97th Year. 3rd Ser. Vol. 110. No. 42 pp. 754-761. With 1 fig.

Professor Brumpt replies to the criticisms of his work on rat typhus in Paris (above), and points out that although he did not find Rickettsia in smears from the tissues of the inoculated guineapigs he did test for immunity to a strain of human typhus supplied to him by WEIGL from Poland.

At the same time on reviewing his own work Brumpt is inclined to the view that he may have been dealing not only with rat typhus virus but also with the virus of rat bite fever since several of the inoculated guineapigs showed atrophy of the testicles and definite glandular enlargement. But in one instance at least a guineapig reacted to the injection of an emulsion of the brains of the wild rats with fever only (no scrotal reaction) and was later shown to be immune to the human typhus virus. D. H.

SPARROW (Hélène). Un an d'entretien d'un virus typhique murin d'origine mexicaine dans un laboratoire d'Europe. [**A Year's Maintenance of a Mexican Murine Typhus Virus in Europe.**]*—Arch. Inst. Pasteur de Tunis.* 1933. July. Vol. 22. No. 1. pp. 13-20.

The two strains of virus under investigation were:—

1. Human typhus virus, European.
2. Rat typhus virus, Mexican.

The virus was kept going by three methods · (a) Passage from guinea-pig to guinea-pig by injection of emulsion of brain.

(b) Passage by tunica exudate

(c) Passage from rat to rat sometimes by brain and sometimes by exudate.

Results—Mexican rat virus: (a) 49 passages in one year. 114 animals used; fever in 92 per cent., scrotal reaction in 50 per cent.

(b) 44 animals; scrotal reaction in 37.

(c) 60 passages, 145 rats, 133 showed fever, 27 died of fever

European virus (human) · 42 passages, 110 guinea-pigs used, 11 no fever, no deaths. 32 were males; 2 showed marked scrotal reaction. D. H.

KRITSCHIEWSKI (I. L.) & RUBINSTEIN (P. L.). Das Fleckfieber bei den wilden Ratten in Moskau. I Mitteilung. [**Typhus in Wild Rats in Moscow.**]*—Zent. f. Bakt.* I. Abt. Orig. 1933. Oct. 6 Vol. 129. No. 7/8. pp 493–501. With 10 figs. [12 refs.]

The authors review work already done on the same lines in America and Europe.

Of rats captured in the city of Moscow 9 were killed and the brains emulsified and inoculated into 3 guinea-pigs. Two of these reacted with fever and swelling of the scrotum. The virus was then passed in series in guinea-pigs. Temperature curves are given and also three microphotographs showing Rickettsia bodies in the cells in smears from the tunica of infected guinea-pigs. This strain of rat typhus virus was then compared with a strain of true louse-carried typhus isolated from a human case. Distinct differences in the reactions in guinea-pigs and in rats were noted and guinea-pigs which had reacted to the human virus subsequently reacted when inoculated with the rat virus. A possible fallacy in this observation is that the test dose was given before the end of the fever due to the initial reaction so that there was a recrudescence of fever rather than a second reaction. However, the authors have shown that in Moscow there are two typhus viruses, one the human louse-borne type and the other the rat virus. D. H.

PIJPER (Adrianus) & DAU (Helen). **A Preliminary Note on a Typhus-like Virus in South African Rats.***—South African Med. Jl.* 1933. Nov. 11. Vol. 7. No. 21. pp. 715–716. With 1 fig. [23 refs.]

Eighteen rats were captured in Potchefstroom where cases of a typhus-like disease have been reported. Their brains were emulsified and injected intraperitoneally into six guinea-pigs. All showed fever typical of a typhus-like infection and the post-mortem changes, enlarged spleen, adrenals and testicles, with marked injection of the brain, confirmed this. Emulsion of the brain of a second passage guinea-pig was injected into four guinea-pigs. Two of them were normal clean animals, one had recovered from fever following inoculation with tick bite fever virus and one from fever caused by typhus virus; the first three reacted to the rat virus, the 4th showed no reaction. These rats then harboured a typhus-like virus differing from tick bite virus and closely related to the virus of South African typhus.

D. H.

endemic typhus fever (rat typhus virus). These diseases are apparently immunologically distinct, is there then a virus which produces a scrotal reaction in guineapigs and is associated with each of these distinct varieties of virus?

The authors attempted to infect man with the emulsion from the scrotum of a guineapig which had been inoculated with the virus of boutonneuse fever but did not succeed. But the emulsion from the scrotum of guineapigs which had been inoculated with the rat typhus virus produced a mild but definite attack of typhus in two men who were experimentally inoculated. A slight rise was noted in the Weil-Felix reaction, 1/125. In view of this result the authors consider that the Neill-Mooser reaction is specific and is due to the virus of rat typhus. D. H.

WEIGL (Rudolf) & HERTZIG (A.) Les corps de Mooser et les rickettsia des poux dans le typhus exanthématique mexicain. [**Mooser Bodies and Lice Rickettsia in Mexican Typhus.**—*Arch. Inst. Pasteur de Tunis*. 1933. Nov. Vol. 22. No 3. pp. 321-324.

The authors repeating MOOSER's work inoculated lice *per anum* with the washings from the infected testicle of a guineapig, the lice became infected and Rickettsia were observed multiplying rapidly in the cells lining the intestine. The lice die of the infection from the 3rd to the 7th day

The appearance is exactly the same when *Rickettsia prowazeki* is inoculated into the lice. The bodies or Rickettsia which appear in the louse cells are agglutinable by the serum of animals infected with Mexican typhus virus. The absorption test also confirmed the identity of the Mooser bodies with Rickettsia.

Conclusions.—The microscopical examinations of lice inoculated with Mooser bodies as well as a study of the serological properties of the bodies confirm the opinion that the Mooser bodies are Rickettsia.

D. H.

NICOLLE (Charles). Corps de Mooser et cellules de Mooser. [**Mooser Bodies and Mooser Cells.**—*Arch. Inst. Pasteur de Tunis*. 1933. Nov. Vol. 22 No. 3. p. 325.

Nicolle agrees with WEIGL that the Rickettsia described in the cells of the tunica of infected guineapigs in rat typhus should be called *R. mooseri* but considers that the endothelial cells filled with these Rickettsia and first described by MOOSER should be called "cells of Mooser." D. H.

NICOLLE (Charles), LAIGRET (J.) & GIROUD (P.). Passage des virus exanthématiques par voie digestive chez le rat. Importance de cette voie dans la transmission naturelle des typhus murins. [**Passage of the Typhus Viruses through the Digestive Tract in the Rat. Importance of this Route in the Natural Transmission of Rat Typhus.**—*Arch. Inst. Pasteur de Tunis*. 1933. Nov. Vol. 22. No. 3. pp. 326-337.

Guineapigs were inoculated with the different viruses and were killed during the fever and the brains fed to rats. The rats showed no fever but guineapigs inoculated from the rats developed a mild form of fever and were proved later to be immune to the virus. Fleas were fed on infected guineapigs and, later, rats ingested the emulsion

of these fleas; they became infected as evidenced by guineapigs used as indicators.

It was not found possible to infect rats by the bite of infected fleas and the authors are of opinion that rats become infected in nature, either by eating infected fleas or by eating the bodies of other rats which were already infected D. H.

SPARROW (Hélène). Transmission du typhus murin du Mexique par les puces de rat à rat. [**Transmission of Murine Typhus of Mexico from Rat to Rat by Fleas.**—*Arch. Inst. Pasteur de Tums* 1933. July. Vol. 22 No. 1. pp 10-12.

Four normal rats were placed in a cage with a rat which had been infected with Mexican typhus virus and killed during the fever. Although none of the rats showed any fever yet all gave a positive Weil-Felix reaction. In another experiment two normal rats were placed in a cage with a living infected animal; both later gave positive Weil-Felix reactions and both proved immune to injection of the rat typhus virus. D. H.

ZINSSER (Hans) & CASTANEDA (M. Ruiz) **On the Isolation from a Case of Brill's Disease of a Typhus Strain resembling the European Type.**—*New England Jl. of Med.* 1933. Oct. 26 Vol 209. No. 17. pp 815-819 With 3 charts. [14 refs]

A severe case with marked coma but only slight rash—death on the 12th day of disease—Weil-Felix reaction negative

On the 10th day of the disease blood was taken from the patient and inoculated into two guineapigs. Both reacted with typical fever but there was no scrotal reaction; and although the strain has been passed through a series of guineapigs only in one instance has the scrotal reaction been noted and that slight and transient. As the authors point out, this fact demonstrated the existence in the larger cities of the north-eastern sea board of the United States of an endemic variety of typhus the virus of which in early animal passages is indistinguishable from that of the classical continental European type. Animals recovered from the fever produced by the Boston strain were found to be immune to both the Mexican and European virus and vice versa. Also guineapigs which were killed during the fever caused by the Boston virus showed the typical typhus lesions in the brain. D. H.

COMBIESCO (D.), POPESCO (C.), STAMATESCO (S.) & ANGELESCO (J.). Sur la perméabilité placentaire au virus du typhus exanthématique. [**Permeability of Placenta to Virus of Typhus.**—*C. R. Soc. Biol.* 1933. Vol. 114. No. 30. pp. 316-317.

Two pregnant guineapigs suffering from typhus fever were killed and the foetuses removed from the uterus; emulsion of the brains was inoculated into normal guineapigs and produced typhus fever proving that the placenta is pervious to the virus. D. H.

PANAYOTATOU (A.). Expériences sur la filtrabilité du virus du typhus exanthématique. [**Filterability of Typhus Virus.**—*Bull. Soc. Path. Exot.* 1933. Nov. 8. Vol. 26. No. 9. pp. 1138-1140.

A guineapig was inoculated with the fluid of 17 ground up fleas (*X. cheopis*). It developed fever on the 5th day with marked scrotal

swelling, and on the 12th day examination of smears from the tunica showed very numerous Rickettsia, both free and in the endothelial cells, a few Rickettsia were also seen in peritoneal smears. The fluid from the tunica and the peritoneum was filtered through an L3 candle and the filtrate injected into a guinea-pig, this animal became infected. The virus was passaged in a similar manner 5 times but it was noted that after the 3rd passage the incubation period was prolonged, the fever was not so marked and there was little or no swelling of the scrotum. D H.

LAIGRET (Jean) & DURAND (Roger) Sur la conservation des virus exanthématiques *in vitro*. [Preservation of Typhus Viruses in Vitro.]—*C. R. Soc Biol.* 1933 Vol. 114 No. 35 pp 897-898

The authors recommend that portions of the organs or the blood of infected animals be placed in tubes of glycerine in the refrigerator at a temperature of -12° to -15°C . By this means they found that the typhus virus was still active up to 20 days and the virus of Rocky Mountain fever up to 35 days D H

NICOLLE (Charles) & LAIGRET (J) Recherches sur un virus typhique murin, isolé à Anvers de rats d'un bateau en provenance de l'Afrique du Nord. Immunités croisées avec d'autres virus exanthématiques. [Researches with a Rat Typhus Virus isolated from Rats on a Ship at Antwerp from North Africa. Crossed Immunity Tests with other Typhus Viruses.]—*Arch. Inst. Pasteur de Tunis*. 1933. Nov. Vol 22 No. 3. pp. 338-345.

The viruses employed in these tests were (1) a typhus virus isolated in 1924 in Tunis from a patient and maintained in the laboratory since that date. (2) A rat typhus virus from Mexico. (3) A rat typhus virus from Toulon (4) A Rocky Mountain fever virus.

Conclusions—There was definite crossed immunity between the Antwerp virus and the three other typhus viruses from Tunis, Mexico and Toulon. But the results of the tests against the Rocky Mountain fever virus were different. In 4 tests in which the inoculation of the fever virus preceded the Antwerp virus, one definite infection resulted, two light infections and one negative result. In 5 tests when the inoculation of the Antwerp virus preceded the fever virus, one definite infection resulted, three light infections and one negative result. All controls showed severe infections and most died. It would appear then that the Antwerp rat typhus virus approaches antigenically more nearly to the Rocky Mountain fever virus than any rat typhus virus yet studied. D. H.

MOOSER (H.) & SPARROW (H.). Immunisations croisées entre un virus du typhus historique (souche tunisienne) et des virus du typhus d'origine mexicaine (souche murine et souche humaine). [Cross Immunization between Historic Typhus Virus (Tunis) and Virus of Mexican Origin Murine and Human.]—*Arch. Inst. Pasteur de Tunis* 1933. July. Vol. 22. No. 1. pp. 1-9.

These cross immunity experiments were carried out in Mexico when Professor NICOLLE was on a visit to that country. Twenty-three guinea-pigs recovered from fever due to Mexican virus gave no

reaction when inoculated with the European virus and the European virus also protected against the Mexican

Passive immunity tests with the serum of convalescents from European typhus showed evidence of protective power against both viruses but the serum of convalescents from Mexican fever showed protective power against itself only.

Weigl vaccine prepared from lice infected with the European virus gave complete protection in guineapigs against this virus but did not protect to the same degree against the Mexican virus. Zinsser vaccine prepared with the Mexican virus did not give any protective power against the European virus. *D. H.*

SPARROW (Hélène). L'épreuve de l'immunisation croisée entre deux virus typhiques virus historique européen et virus murin mexicain. [**Cross Immunization between European Typhus Virus and Mexican Typhus Virus in Rats.**—*Arch. Inst. Pasteur de Tunis.* 1933. July. Vol. 22 No. 1. pp. 21-35.]

The inoculation of the Mexican virus immunized 80 per cent. of the guineapigs against the European virus. The inoculation of the European virus protected 91 per cent of guineapigs against the Mexican virus. *D. H.*

NICOLLE (Charles) & LAIGRET (J.) L'épreuve des immunités croisées entre les virus typhiques et le virus de la fièvre pourprée des Montagnes Rocheuses. Quelques faits d'extension du pouvoir immunisant de ces virus [**Cross Immunity between Typhus Virus and Virus of Rocky Mountain Fever.**—*Arch. Inst. Pasteur de Tunis* 1933. July. Vol. 22. No. 1 pp. 36-46]

Twenty-five guineapigs which had reacted to typhus virus (13 European virus and 12 Mexican virus) were inoculated with the virus of Rocky Mountain spotted fever, all reacted with one exception. There was no immunity, yet the mortality in these animals was considerably less than among the controls.

Two monkeys which had been inoculated on three occasions with different typhus viruses did *not* react when subsequently inoculated with the virus of Rocky Mountain fever. Apparently, as LÉPINE has suggested, the repeated injection of typhus virus not only protects against such virus but also against a distinct virus of the same group, in this instance the virus of spotted fever. *D. H.*

JELIN (W.) & FRÄNKMAN (E.). Ueber die Behandlung von Flecktyphus mit Rekonvaleszentenserum. [**Treatment of Typhus by Convalescent Serum.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1933. Dec. Vol. 37. No. 12 pp. 528-535. With 6 figs. [13 refs.]

Convalescent serum has undoubtedly a curative effect on typhus fever in guineapigs. The serum was drawn off from patients 10 days after the fever had ceased. The effect was more marked when the serum was given early and in large doses, for instance 24 to 48 hours after the injection of the infective material into the guineapigs.

In treated animals which showed no fever the typical lesions could be found in the brain on post mortem examination, a latent infection. The action of the convalescent serum is specific; normal human serum had little or no effect but curiously enough normal sheep

serum had some. It is proposed to follow this up since the great drawback to the use of convalescent serum is the difficulty of obtaining it in sufficient quantity.

D. H.

BLANC (Georges), NOURY (M), BALTAZARD (M) & BARNEOUD (J.). Essais de vaccination humaine contre le typhus exanthématique avec un vaccin vivant [**Attempts to vaccinate Man against Typhus with a Living Vaccine.**]*—Bull. Acad. Méd.* 1933 Oct. 31. 97th Year. 3rd Ser. Vol. 110 No 34. pp 274-282 With 6 charts.

The virus utilized in these experiments was a rat typhus virus of low virulence isolated in Casablanca which had been shown to produce only a mild fever without any general symptoms in man or animals.

Several volunteers were inoculated with this virus and a mild reaction resulted. When later reinoculated with a dose of the same virus there was no reaction at all and only slight fever when they were tested with a Toulon rat virus. By treating the T.M.C. virus* with ox bile it was still further attenuated although still active, producing slight febrile reaction in man and these men later were shown to be immune to injections of the Toulon rat typhus and a virus of epidemic (H) typhus virus. Lice fed on these protected people did not become infected either after the immunizing dose or the test dose, i.e., they did not become carriers of the germ.

D. H.

WEIGL (Rudolf). Faits d'observation et expériences démontrant l'efficacité du vaccin à rickettsia pour la prévention du typhus. [**Observations and Experiments demonstrating the Efficacy of Rickettsia Vaccine in Prevention of Typhus.**]*—Arch. Inst. Pasteur de Tunis.* 1933. Nov. Vol. 22. No. 3. pp. 315-320. [Summary appears also in *Bulletin of Hygiene*.]

This vaccine is prepared by emulsifying in carbolized saline the intestines of lice which have been infected *per anum*. The vaccine has been largely used in Poland, some 6,000 persons having been inoculated. Of those who had received three doses of the vaccine (2,755) none developed typhus although all were exposed to infection—doctors, nurses and orderlies in charge of disinfection of clothing of typhus patients. Missionaries in China have also been successfully protected by this vaccine.

NICOLLE inoculated a child with 3 doses of vaccine, then gave a test dose of infected material; the child proved immune; guinea-pigs inoculated with the test material became infected. A laboratory worker was inoculated with the vaccine and numerous infected lice were fed on her without any reaction whereas three others not protected all developed typhus. Another worker inoculated during the incubation period developed fever but lice fed on him did not become infected. Inoculated people who do develop the disease have a mild attack and are no danger to others since the virus is not present in the peripheral blood.

D. H.

* Typhus murin Casablanca.

CHRZANOWSKI (B.) & MOSING (H.). Sur l'emploi des rickettsia des crottes de poux pour la vaccination contre le typhus exanthématique. [**The Use of the Rickettsia in the Excreta of Lice for Vaccination against Typhus.**—*Arch. Inst Pasteur de Tunis*. 1933. Nov. Vol. 22. No. 3. pp. 346-349.]

The authors have found that Rickettsia remain in the excreta of lice for very long periods, several years. At first inoculation of the excreta produced severe reactions.

The method now employed is to emulsify the excreta in phenol saline 0.5 per cent.; a thick emulsion results which is centrifuged lightly and the supernatant fluid containing the Rickettsia pipetted off; this is then centrifuged again at a high speed, the Rickettsia are thrown down and the fluid removed; the sediment is then washed several times until a suspension of pure Rickettsia is obtained. This vaccine has been tested on some 250 guineapigs and compared with Weigl's original vaccine. It produces just as good immunity as the intestinal vaccine of Weigl. The amount of vaccine prepared from the excreta of 2 lice during 3 days has been found sufficient to immunize a guineapig. No local reaction was noted in any of the guineapigs nor in any of the men inoculated. Vaccines prepared from excreta 2 years old were as potent as those prepared from fresh excreta. The serum of inoculated guineapigs contained agglutinins for the Rickettsia. The employment of this vaccine would effect large economies in time and personnel.

D. H.

BRUMPT (E.) Transmission de la fièvre pourprée des Montagnes Rocheuses par la tique américaine *Amblyomma cayennense*. [**Transmission of Rocky Mountain Fever by *A. cayennense*.**—*C. R. Soc. Biol.* 1933. Vol. 114. No. 31. pp. 416-419.]

The author collected female *Amblyomma cayennense* ticks in Mexico and bred from them in Paris. They were found to transmit Rocky Mountain fever. Nymphs of these ticks were fed on guineapigs infected with the virus of Rocky Mountain fever by Dermacentor ticks. The adults from these nymphs which developed were fed on normal guineapigs and these had typical attacks of Rocky Mountain fever.

It would appear to be established that Rocky Mountain fever of the United States and Sao Paulo typhus are identical as they protect the one against the other and can be carried by a common vector. [See this *Bulletin*, Vol. 30, pp. 893-4.]

D. H.

DAVIS (Gordon E.) & PARKER (R. R.). **Additional Studies on the Relationship of the Viruses of Rocky Mountain Spotted Fever and Sao Paulo Exanthematic Typhus.**—*Public Health Rep.* 1933. Aug. 18. Vol. 48. No. 33. pp. 1006-1011. With 3 charts.

Guineapigs which have received Rocky Mountain spotted fever vaccine are protected in equal degree against spotted fever virus and Sao Paulo virus. Guineapigs which have recovered from Sao Paulo disease are completely resistant to spotted fever virus. Monkeys which have recovered from spotted fever virus are completely resistant to Sao Paulo virus.

These results are additional evidence of the essential identity of the two viruses.

D. H.

- MONTEIRO (J. Lemos). O "typho exanthematico de S. Paulo" e suas relações com a febre maculosa das montanhas rochosas, a luz das provas de imunidade cruzada. [**Relationship of Sao Paulo Typhus and Rocky Mountain Spotted Fever in light of Crossed Immunity Tests.**]—*Brasil-Médico*. 1933. June 24. Vol. 47. No. 25. pp. 437-442. [10 refs.] English summary.
- . Résultat de l'épreuve d'immunité croisée entre le typhus exanthématique de Sao Paulo et la fièvre pourprée des Montagnes Rocheuses [**Crossed Immunity Test between S. Paulo Typhus and Rocky Mountain Fever.**]—*C. R. Soc. Biol.* 1933. Vol. 114. No. 30. pp. 374-376.

A comparative study made in Brazil between the virus of Rocky Mountain fever and the virus of the Sao Paulo typhus fever.

- (1) Guineapigs that had reacted to the virus of Sao Paulo typhus were found to be immune to the virus of Rocky Mountain fever.
 - (2) Guineapigs which had been immunized against the Sao Paulo virus by means of a vaccine prepared from infected *Amblyomma* ticks were also found to be immune to Rocky Mountain fever virus.
- DYER has already shown that the reverse is true, that is, animals immunized to Rocky Mountain fever are immune to Sao Paulo virus.

Conclusion.—The Sao Paulo typhus belongs to the group of typhus-like fevers and represents a variety of Rocky Mountain fever.

D. H.

- BONCINELLI (Umberto). Forme inapparenti della febbre esantematica mediterranea. [**Inapparent Forms of Mediterranean Typhus.**]—*Sperimentale*. 1933. Vol. 87. No. 3-4. pp. 337-341. English summary (8 lines).

In September three cases of fever occurred at the Technical Police School in Rome. All three patients were in charge of police dogs many of which were heavily infested with ticks, *R. sanguineus*. The sera of those attacked gave a positive Weil-Felix reaction one on the 14th, one on the 17th day of disease in a titre of 1 in 320; the third was negative until convalescence (25th day) when he reacted positively in 1 in 640. The author then tested the blood of 19 other officers of the school who had been in contact with those previously attacked and in the same environmental conditions but who had had no clinical symptoms of infection. Two gave a positive reaction in 1 in 160 indicative of inapparent infection; two others reacted in a low dilution of 1 in 40.

H. H. S.

- PETZETAKIS & KARALIS. Fièvre boutonneuse et séroréaction de Weil-Felix. [**Boutonneuse Fever and the Weil-Felix Reaction.**]—*C. R. Soc. Biol.* 1933. Vol. 114. No. 31. pp. 470-471.

Boutonneuse fever has been recognized in Greece; of 7 cases investigated 3 gave a positive Weil-Felix reaction of 1/500 or over.

D. H.

- VAN SLYPE (W.). Un cas probable de fièvre boutonneuse. [**A Probable Case of Boutonneuse Fever.**]—*Ann. Soc. Belge de Méd. Trop.* 1933. Oct. 30. Vol. 13. No. 3. pp. 373-378.

A case of fever with maculo-papular eruption in a young European who had been 8 years in the Congo.

A primary sore or typical "tache noire" was noted in the neighbourhood of the scrotum with local adenitis and lymphangitis. There was no history of tick bite and the Weil-Felix reaction could not be tested

D. H.

ESCHBACH (H.). Fièvre exanthématique méditerranéenne. [**Mediterranean Typhus.**]—*Bull et Mém Soc Méd Hôpit de Paris* 1933. Dec. 4. 49th Year. 3rd Ser No 30 pp 1406-1407.

A case of Marseilles (boutonneuse) fever in a neighbourhood in France where the disease had never previously been reported. This case was contracted in Avignon and imported into Berny. A typical "tache noire" was noted but the Weil-Felix reaction was negative

D. H.

KIMURA (Ren), MISUGI (Yoshitoshi), HIRAI (Teizô) & MIYAZAWA (Yoshitaka). Untersuchungen ueber den Erreger der Tsutsugamushikrankheit in den Gewebskulturen. [**The Virus of Tsutsugamushi Fever in Tissue Culture.**]—*Trans. Japanese Path. Soc.* 1932 Vol 22 pp. 668-670.

Method—A young normal rabbit was bled and the lung removed and cut into small pieces, these pieces were washed in Ringer's solution and placed for 20 minutes in an emulsion of infected rabbit testicle. The pieces of lung were then removed and cultivated in a medium of rabbit heparine plasma at a temperature of 38°C

After ten days incubation the pieces of tissue were removed and examined and very numerous Rickettsia were demonstrated in the cells lining the alveoli of the lung and also in the histiocytes but not in leucocytes or red cells. The morphology of these organisms was studied and the authors state that they were identical with *R. orientalis* as described by NAGAYO in the cells of Descemet's membrane.

D. H.

NISHIBE (Masujirô), HOSONO (Shichirô) & MIYAZAWA (Masaei). *Rickettsia orientalis* in Tissue Culture.—*Trans. Japanese Path. Soc* 1932 Vol 22. pp. 670-680.

The authors employed a similar method to that described in the previous paper by KIMURA and others but in addition to normal lung tissue they employed embryo chick tissue with success. As well as in the alveolar cells they found that the organisms multiplied in the macrophages, in endothelial cells and in fibroblasts and in various types of cells in the embryo chick tissue. Employing these methods it was found that *R. orientalis* could be maintained without loss of virulence or numbers through 12 generations covering a period of 135 days. *R. orientalis* is essentially an intracellular parasite.

D. H.

KAWAMURA (R.), IMAGAWA (Y.) & ITO (T.). Weil-Felix'sche Reaktion bei der Tsutsugamushi-Krankheit. [**Weil-Felix Reaction in Tsutsugamushi Disease.**]—*Trans. Japanese Path. Soc.* 1932. Vol 22. pp. 691-697.

The sera of 32 cases of tsutsugamushi fever were tested against cultures of *Proteus*; the strains employed were obtained from Dr. FELIX of the Lister Institute and both the H & O forms of X₁₉, X₂ and XK were utilized.

All the sera gave negative reactions with the O form of X_2 and X_{19} but on the other hand all with one exception agglutinated XK, both O and H forms equally. Ten cases gave a positive reaction of 1/800 or higher, 17 reacted up to a dilution of 1/400 and 4 gave a positive in 1/100. The sera in some of the cases were taken some months after fever had ceased. Sera of infected rabbits and monkeys were also tested and gave a positive reaction with OXK, negative with OX₁₉.
D. H.

HAYASHI (Naosuke) **On Tsutsugamushi Disease.**—*Trans. Japanese Path Soc.* 1932 Vol. 22. pp. 686–690.

The author points out that in 1922 he described the virus of tsutsugamushi fever and gave it the name of *Rickettsia tsutsugamushi*. Later other observers described a similar organism and named it *R. orientalis*. The majority of research workers in Japan are agreed that these two organisms are identical and therefore the name *R. tsutsugamushi* should stand.
D. H.

NARITOMI (C). Das unbekannte Fieber der Boko-Inseln (Pescadores-Archipel) und der Nachweis von *Rickettsia orientalis* mit Hilfe der Augenkammer-Methode (Vorläufiger Bericht). [The Unknown Fever of Boko Island and Demonstration of *Rickettsia orientalis* by Injection of the Anterior Chamber of the Eye.]—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1933. Sept. Vol. 32. No. 9 (342). [In Japanese pp. 1291–1292. German summary pp. 128–129]

An exanthematous fever has been noted for some years in the Islands of Boko in the Pescadores Archipelago (off Formosa). By injection of the blood of patients into the eyeball of rabbits this fever has now been proved to be identical with tsutsugamushi disease.

D. H.

GOMES (Luiz de Salles). Typho exanthematico de São Paulo. Virus exanthematico, sob condições naturais, isolado de carrapato (*Amblyomma ovale* Koch) capturado em cão de zona infectada.—*Brasil-Médico*. 1933. Dec. 31 Vol. 47. No. 52. pp. 919–922. With 2 charts. English summary.

HIRSZFELD (L.) & HALBER (W.). Ueber die Bordet-Wassermannsche Reaktion bei Flecktyphus. Beitrag zur Theorie der B. W. Reaktion.—*Acta Path. et Microb. Scandinavica*, 1933. Supplement 16. pp. 114–131.

MOREIRA (João Affonso) & MAGALHÃES (Octavio). Typhus exanthematico em Minas Geraes.—*Brasil-Médico*. 1933. Aug. 26. Vol. 47. No. 34. pp. 599–601. With 5 charts.

PLAZY (L.) & DAMANY (P.). Maladie de Basedow consecutive à un typhus endémique bénin.—*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. pp. 992–993.

TANAKA (Keisuke). Sind die japanischen Rickettsien die Erreger der Kedani-(Tsutsugamushi-) Krankheit?—*Zent. f. Bakt.* I. Abt. Orig. 1933. Oct. 6. Vol. 129. No. 7/8. pp. 490–492.

CARRION'S DISEASE.

RIBEYRO (Ramon E.). Verruga peruana y paratifo B [Verruga Peruviana and Paratyphoid B.]—*Crónica Méd.* Lima. 1932. Dec. Vol. 49. No. 834. pp. 361-376. [11 refs.]

Much of this article consists of quotations of the work and opinions of others. It may be summed up briefly by stating that whereas ordinary verruga is quite a mild condition, when complicated by infection with *Bact paratyphosum B* it becomes very serious; in fact the author states "every case of Oroya fever complicated by Paratyphoid B terminates fatally without exception." The figures he quotes certainly tend to support this contention:—

	Cases	Infected with Para B	Died	Recovered
Dr Ribeyro . . .	19	6	6*	—
Dr Arce . . .	2	2	1	1
Dr Tamayo . . .	10	10	10	0
Dr S Bernales . . .	3	1	1	0
Dr Olachea . . .	2	0	0	2

* In the tabular statement there were 7 deaths, six infected with paratyphoid B and one with exanthematic typhus as a complication

Dr. TAMAYO is quoted as saying "the severe Carrion's disease is a verruga patient with paratyphoid" (La fiebre grave de Carrión es el Paratífus de los verrucosos), while Oroya fever itself uncomplicated is not a formidable infection [16 recovering out of 17 is one record quoted, the fatal case being complicated by typhus. MANSON-BAHR gives the fatality at 10-40 per cent. (presumably taking all cases together)]. The obvious remedy is for those exposed to verruga to be prophylactically vaccinated against paratyphoid B. H. H. S.

MAKEHENNIE (Daniel). Mésenchyme et maladie de Carrion. [Mesenchyma and Carrion's Disease.]—*Rev. Sud-Américaine de Méd. et de Chirurg.* 1932. Apr. Vol. 3. No. 4. pp. 323-336.

Treats of Oroya fever and incidentally verruga from the histo-haematological aspect. The author describes first the Bartonella bodies and the best ways of staining them for purposes of study. He then details the histological findings in Carrion's disease (and verruga), especially the changes in the blood and haemopoietic organs.

Interposed is a disquisition on the histogenesis of the blood corpuscular elements with remarks on the different forms, or better perhaps, degrees of anaemia according to the severity of the case: 1. With simple regeneration—the presence of polychromatophilia, and normoblasts, basophilic stippling, Jolly bodies, etc.; 2. Hypoplastic with poor response (lenteur) on the part of the medulla; 3. Megalocytic, nearly always of grave prognosis.

From the haematological point of view also he subdivides the vascular reaction into three phases: 1. At the onset, predominance of "mesenchymatous" cells—i.e. Rocha's proliferation of angioblasts

en masse, 2. Reduction of these cells, but increase in endothelial cells, some embryonic, some mature, 3. Involution of vessels with predominant infiltration of eosinophils (though not in excess in the peripheral blood) and with extravascular leucocytes. He notes that a similar endothelial proliferation occurs in exanthematic typhus and Rocky Mountain fever.

The questions which he postulates. What is the explanation of the anaemia which, according as it is simple or pernicious, imparts a benign or malignant character to the infection? Is it due to the virulence of the organism (*Bartonella*) or to resistance set up by the patient? he proposes to deal with in a subsequent article. *H. H. S.*

MAKEHENNIE (Daniel). L'anémie dans la maladie de Carrion. [*Anaemia in Carrion's Disease.*]—*Rev. Sud-Américaine de Méd. et de Chirurg.* 1932 Dec. Vol 3 No. 12. pp. 967-972.

The author discusses the various theories which have been put forward to account for the occurrence of severe and often fatal anaemia in Oroya fever. Six cases of verruga may occur in one household and only one develop this form of pernicious anaemia. He considers that variation of virulence of the parasite would not account for it and falls back on "personal idiosyncrasy." He also suggests that secondary infections may play a part. *D. Harvey.*

MONGE (Carlos) & MACKEHENIE (Daniel). Formas neurológicas de la verruga. [*Neurological Forms of Verruga.*]—*Crónica Méd.* Lima. 1933. April, May & June. Vol. 50. Nos. 838, 839 & 840. pp. 123-135; 158-162; 200-209. With 1 chart.

The authors give notes of a dozen cases of nerve conditions associated with verruga, half of them terminating in death. The majority appear to have been definitely related with verruga or Oroya fever as cause and effect, but one or two are less convincing. Thus in one with encephalitis and a terminal meningitis there was a positive Wassermann reaction and no anaemia, another presented symptoms of encephalitis, was cured and left hospital and "a month and a half later returned with a verruga eruption which ran a course without complications." A third is dismissed briefly thus, "a recent case of severe Carrion's disease in a child who the day before it died had a convulsive attack of an epileptiform character followed by coma and death." A fourth suffered from epileptic convulsions; his blood showed a uraemic condition with leucocytosis. It is true *Bartonella* bodies were seen, but the evidence that the two were causally connected is scanty. The others presented symptoms of encephalitis, meningitis, cerebellar disease, cerebral haemorrhage, and *Bartonella* bodies were found. The subject is one which deserves, in fact demands, further study. *H. H. S.*

GALLIARD (H.). A propos de *Bartonella bacilliformis* et *Eperythrozoon noguchii*. Unicité ou dualité de la verruga et de la fièvre de Oroya. [*Unity or Duality of Verruga and Oroya Fever.*]—*Bull. Soc. Path. Exot.* 1933. July 12. Vol. 26. No. 7. pp. 925-929.

It has been recently suggested by LWOFF that there are two organisms the one, *Bartonella*, responsible for verruga and the other

Eperythrozoon noguchii (LWOFF and VAUCEL 1931) the cause of Oroya fever. This organism has been figured as coccoid bodies in the blood of monkeys by NOGUCHI but he did not consider them to be of pathological significance, similar bodies have been described by other observers.

LWOFF believes that the reason why cultures from the blood of cases of verruga or Oroya fever produce verruga only in monkeys is because Bartonella can be cultivated whereas the eperythrozoon cannot. Galliard in the paper under review points out, however, that NOGUCHI did produce a condition resembling Oroya fever in monkeys by means of the injection of a culture of Bartonella; and also the injection of the blood of cases of Oroya fever produces no result, whereas the same blood after culture and multiplication of Bartonella produces verruga.

Galliard does not accept the conclusion of LWOFF and holds that verruga and Oroya fever are different manifestations of the same disease. Bartonella can be observed in the red cells of cases of verruga and also in cases of Oroya fever and the eperythrozoon has not been observed in the blood of man.

D. H.

DENGUE.

JAFAR (M.) & SINGH (Bachan). **Dengue Fever in the Rangoon-Mingaladon Area.**—*Indian Med. Gaz.* 1932. Dec. Vol. 67. No. 12 pp. 674-676. With 3 charts.

The authors state that dengue fever is endemic in Rangoon and neighbourhood; sporadic cases occur throughout the year but chiefly in the rainy season, April to September, which is also the season of maximal prevalence of *Aedes aegypti*.

Clinically the cases are mild, "break bone" pains being noted in a small percentage. The rash was only noted in 16 per cent. of the Europeans and in 5 per cent. of Indians.

D. Harvey.

WATSON (Malcolm). **A Case of Dengue Fever with Hyperpyrexia.**—*Jl. Trop. Med. & Hyg.* 1933 June 1. Vol. 36 No. 11. pp. 157-158. With 1 chart.

The patient was a Eurasian girl aged 13 months. The temperature reached 105.6° once in the arm pit and frequently over 104° in the rectum. Cold packs and sponging were employed when it rose over 102°. The desquamation which followed was as severe as that following scarlet fever. The child made a good recovery.

D. H.

AKASHI (Kazuyoshi). Die letzte Dengue-Epidemie in Tainan (Formosa).—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1932 July. Vol. 31. No. 7 (328) [In Japanese. German summary pp. 69-70.]

COCHRANE (E). First Reported Cases of Dengue Fever in British Guiana.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. July 28 Vol. 27. No. 2. pp. 211-212.

LEPROSY.

DE SOUZA-ARAUJO (H. C.) Contribuição á epidemiologia e prophylaxis da lepra no norte do Brasil. [*Epidemiology and Prophylaxis of Leprosy in Northern Brazil.*]—*Mem. Inst. Oswaldo Cruz.* 1933 Sept Vol 27. No. 3 pp. 165-337. With 87 figs. on 45 plates

This article, obviously the outcome of much careful study and observation, is unfortunately too detailed and subdivided for abstracting. The author gives the figures of the leper census in the various districts of Northern Brazil, the occupation of those affected, accounts of the many leprosaria, dispensaries, etc. and the cost. The whole is well and abundantly illustrated with photographs.

The following are the main conclusions:—

1. Among a population of 14,655,000 there are 7,964 known cases of leprosy and it is estimated that there are at least 13,400. Of the total 1,903 are isolated.

2 The problem is such that a national campaign should be undertaken at the national cost.

3. A proper census should be made and a clinical classification of the lepers found, if prophylaxis is to be effective. This would necessitate travelling commissions in the rural districts, and the members might at the same time undertake vaccination against smallpox, treatment for helminthiasis, for malaria, yaws, etc. *H. H. S.*

HIGGINS (M. E.). *Leprosy in the Philippines.*—*U.S. Nav. Med. Bull.* 1933. Oct. Vol. 31. No. 4. pp. 363-367.

This is a brief account of a visit of a U.S. Naval Surgeon to the Philippines leper institutions, including Culion with 5,700 cases and 2,000 segregated in treatment stations, in addition to early cases now being treated at "skin clinics" in the towns. An agricultural colony has now been provided near the Culion settlement for paroled patients who do not wish to return to their homes. In 25 years there has been no infection of any doctor, nurse or attendant on the lepers. Additional measures have been recommended to remove the highly susceptible children of leprous parents at birth, and for the sterilization of male lepers and birth control, but there are manifest difficulties. It is estimated that \$11,000,000 have been expended on the control of leprosy since the Culion settlement was opened in 1906, and at present nearly one-third of the health appropriation is devoted to leprosy control. *L. Rogers.*

LEPROSY IN INDIA. 1933. Oct. Vol. 5. No. 4. pp. 177-244. With 13 figs. (8 on 3 plates). Issued quarterly by the Indian Council of the British Empire Leprosy Relief Association.

Most of this number is taken up with papers read at the Calcutta Conference in March 1933, a summary of which has already been published in "Leprosy in India."

An important paper is also included by Dr. E. MUIR on the Leprolin diagnostic test of Mitsuda. For this Muir has used intradermal injections of emulsions of lepra nodules containing Hansen's bacillus, which he calls H leprolin, and of the spleens of rats infected with the bacillus of Stefansky, which he calls S leprolin, both being tested

in his cases at the same time. The leprous material is boiled for one hour, dried in a desiccator and suspensions made as required by washing three times in saline; the sediment forming in 10 minutes is discarded, and the bacillary suspension diluted with 0.5 per cent. carbolic, 0.4 of the dried powder being thus made up to 100 cc., and a dose of 0.2 cc. injected intradermally. In healthy persons and recovered or burnt out nerve cases a reaction follows in the form of erythema and induration of 5 to 20 mm. in diameter, and in severe reactions pustulation at the centre; the extent of these should be noted weekly for six weeks. In active skin cases no reaction occurs, apparently owing to the tissues having become accustomed to the toxins formed by the causative organism. Six series of experiments were carried out from which the following conclusions were arrived at: Intradermal injections of suspensions of both pathogenic and non-pathogenic acid-fast bacilli produce reactions in healthy subjects, and in persons not infected with leprosy the H and S leprolins give about the same reactions, but in dermal leprosy with numerous bacilli only the S leprolin gives reactions. In very young children the reactions with both are negative or slight, indicating weak resistance to leprosy infection, and in nerve leprosy with few bacilli the reaction to Hansen's leprolin is increased, indicating resistance to the infection, a strong reaction indicating a favourable prognosis, so any treatment which changes a negative H reaction into a positive one is likely to be beneficial.

L. R.

DENNEY (O. E.). *Leprosy in the Southern United States: from the Histories of 687 Cases Hospitalized in the National Leprosarium.*—*Southern Med. Jl.* 1933. Sept. Vol. 26. No. 9. pp. 763-768. With 6 figs

This is an historical account of the incidence of leprosy in Louisiana and other portions of the Southern United States. The disease was introduced to the western hemisphere by the early settlers from Europe and by the African slave trade, and was not uncommon 150 years ago in the Mississippi delta. In 1872 it was found to be spreading among persons mainly of French descent. Spot maps and tables of the cases admitted to the Louisiana Leper Settlement at Carville, the Federal Leper Hospital since 1921, show that 434 of the 565 admissions from the Southern States were from Louisiana.

L. R.

ORTEGA NIETO (Luis). *La lepra en Andalucía.* [*Leprosy in Andalusia.*].—*Rev. San. e Hig. Pública.* 1933. Dec. Vol. 8. No. 12. pp. 598-614. With 2 graphs & 2 maps.

The author gives by way of introduction the numbers in round figures of lepers in the various countries; in Spain he mentions about a thousand. The figures for certain years are stated; thus in 1851 there were said to be 281, in 1914, 898, a fall in 1924 to 579, followed by rises to 739 in 1928 and 883 in 1932. A small map is reproduced showing by depth of shading the prevalence of leprosy in Spain; it varies from 82 in the Canaries and 57 in Málaga down to 1-2 in Almería. Of the whole of Spain Andalucía is the chief leprosy area and within it Málaga, Córdoba and Jaén head the provinces in numbers of lepers. Another map demonstrates this.

Next follows a list of provincial Leprosaria, remarks on the clinical aspects of the disease and its treatment, with respect to which there is nothing to record. The author concludes by saying that there is need of a leprosarium in Andalusia, with a section for incurables, and for treatment centres for infective patients, also for an "orphanage" for the children. Medical men should be trained in leprosy diagnosis in order that the disease may be recognized in its early stages. *H. H. S.*

KISSMEYER (A). Om spedalskhedens forekomst i de skandinaviske lande siden 1900 [**The Incidence of Leprosy in the Scandinavian Countries since 1900.**—*Hospitalstidende* 1933 Sept. 7 Vol. 76. No 36 pp. 929-936 With 4 figs & 1 map]

Recent enquiries as to the incidence of leprosy in Iceland, Finland and the Scandinavian countries have yielded the following information
Denmark.—Since 1900 only 5 cases have been observed, the source of infection in every case being some foreign country.

Iceland.—The primitive leper hospitals were abolished in 1848 on the assumption that leprosy was not an infectious but a hereditary disease. The disease, accordingly, spread, and in 1896 there were about 250 lepers. A leper hospital opened in 1898 accommodated 60 patients. In 1932 the total number of lepers was reduced to 25. The benign anaesthetic form of the disease is now much more common than the nodular form.

Finland.—A census of lepers taken in 1893 and repeated in 1897, 1904, 1924 and, most recently, in 1931, does not show the uniform decline observed in Iceland and Norway. There was, indeed, a considerable rise in 1904. As in Iceland, the nodular form of the disease has dwindled more rapidly than the maculo-anaesthetic form; in 1904, the former represented 76 per cent. of all the cases, whereas at present it represents only 20 per cent. Most of the 34 lepers alive on Dec. 31, 1931, were old, as many as 26 of them being between the ages of 50 and 90. The geographical distribution of leprosy is limited to the south-west corner of the country.

Norway.—In 1931 there were only 58 lepers alive, and 44 of them were housed in two hospitals in Bergen. In the 5-year period 1926-1930, only 3 new cases were observed. During this period the number of surviving lepers was reduced by more than 50 per cent.—a death-rate which is explained by the high average age of the lepers.

Sweden.—In 1911 there were still 66 lepers alive. At the present time there are only a score. Here, too, the rapid decline in the number of lepers is due to their high average age and the scantiness of new recruits; since 1928 only two new cases have been observed.

Kissmeyer associates the rapid decline and prospective extinction of leprosy in the countries under review with the isolation of the worst cases, particularly the nodular and mutilated forms.

C. Lillingston.

LEPROSY REVIEW. 1933 Oct. Vol. 4. No. 4. pp. 135-183. With 1 diagram, 2 plates & 2 figs.—Quarterly Publication of the British Empire Leprosy Relief Association, 29 Dorset Square, London, N.W.1.

Leprosy in the Federated Malay States is dealt with by G. A. RYRIE, who reports 353 admissions to the Federated Leprosy Settlement in

1932 and increase of the inmates from 996 to 1082. The death rate has been reduced by good nursing. Alepol intravenously did not give good results so the esters are being mainly used. The oral Tai Foong Chi treatment is not considered safe in early cases, as there is a risk of its inducing reactions with a more rapid spread of the disease. In the treatment of reactions 5-10 cc. of a 2 per cent solution of mercuriochrome intravenously is of value, as are 10-20 cc. of calcium glucinate intravenously. The Fijian Calophyllum oil esters were beneficial in nerve pains and reactions. The deaths were 61, or 5-6 per cent., with chronic nephritis found post mortem in all advanced cases, and 91 patients were discharged after six months observation with negative microscopical and clinical examinations.

In a report on four years work in the S. Rhodesia Ngomahuru Leprosy Hospital Dr. B. MOISER states "I am tempted to say that all early cases are curable, and many old-standing ones also." He found 3 per cent solutions of alepol of little value, but with 1 to 10 cc. doses of 6 per cent. solutions twice weekly intramuscularly some remarkable cures were obtained, but the treatment is painful. The most painless injections were up to 5 cc of iodized esters, to which all early cases reacted well, but it is expensive. Regular microscopical examinations are made and two years negative results are required as a rule before discharge, but over 260 have been sent out in four years.

In contrast to the above Dr L E S SHARP at the Kigezi Leper Settlement of S W Uganda obtained no demonstrable results from the use of hydnocarpus oil preparations in his leprosy cases, no less than 21.5 per cent. of which were very advanced nodular ones, "indicating very heavy infection". He advocates the settlement policy with ample land, which enables the lepers to "cultivate their own food and become more or less self-supporting within six months", this reduces the cost of their maintenance to a minimum. The children of the lepers are isolated from infected parents.

L. R.

LEPROSY REVIEW. 1934. Jan. Vol. 5. No. 1. pp. 1-50. With 3 figs on 2 plates & 1 chart. Quarterly Publication of the British Empire Leprosy Relief Association, 29 Dorset Square, London, N W.1.

The Aden leprosy problem is dealt with by E. S. PHIPSON, who points out that lepers are being attracted to the Mission Leper Hospital from the surrounding areas in such numbers as to cause difficulties.

The treatment of lepra reactions by intravenous injections of 10 cc of a 2 per cent. solution of "fluorescein-soluble" twice weekly is favourably reported on by G. A. RYRIE in the Malay States, for out of 31 cases 13 showed a rapid recovery after one or two injections and 15 more showed a decline of the fever by lysis after 3 to 6 injections. He regards its action as being similar to the fluorescein-containing mercuriochrome, while it is less toxic. Calcium therapy and a milk and fruit diet help.

A belated account of the April 1933 meeting of the General Committee of Belra appears in this number, which was addressed by the Rev. P. B. Clayton the founder of Toc H, who had recently seen leprosy work in Malaya and Nigeria.

In the first part of an article on leprosy in India and Ceylon by R. G. COCHRANE the resolutions of the 1933 Calcutta Leprosy Conference are reprinted.

In the first annual report of the Uzuakoli Leprosy Colony in S. Nigeria, J. A. K. BROWN records the first eight months work in organizing the colony, which has 389 patients, nearly all advanced ones with little hope of improvement, but whose isolation is an advantage, 98 out-patients attended for treatment. The stronger patients work two days a week and grow food crops, and they have built two townships for the men and women respectively and made roads. The majority of the early cases, and the able bodied of the more advanced cases, are showing some improvement under treatment. L. R.

BURNET (Etienne). La lèpre et les missions. [**Leprosy and Missions.**]—*Rev. d'Hyg. et de Méd. Préventive*. 1933. Nov. Vol. 55. No. 9. pp 690-695.

This short note points out that much of the care of the world's lepers is being undertaken by missions, the Roman Catholics providing priests and nuns to care for the spiritual needs and nursing, while Protestants supply medical missionaries who also undertake treatment. Dr. Burnet appears to think that these two functions should be kept separate, religious help being distinct from medical, a conclusion he has arrived at after extensive tours in leprosy areas as Secretary to the Leprosy Commission of the League of Nations. L. R.

SOETOMO & SOETOPO. Bijdrage tot rationeeler bestrijding der lepra. [**A Rational Method for the Eradication of Leprosy.**]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1933. Oct. 10. Vol. 73. No. 21. pp. 1299-1308.

The contentions of the authors are summed up as follows:—
1. Children are susceptible and adults are little susceptible to leprosy.
2. Children play an important rôle in spreading leprosy. They are the chief source of infection, which is by direct contact and transmitted from child to child.
3. Any campaign against leprosy should be directed against children and should consist in removal of infected children from their surroundings and their consignment to institutions.
4. The object of these homes should be (a) the elimination of the source of infection; (b) the treatment of leprosy in the early stage. A successful campaign on these lines involves the abandonment of the previous method of segregation of adult advanced cases.

W. F. Harvey.

LOWE (John). **Bacillaemia in Leprosy.**—*Indian Med. Gaz.* 1933. Sept. Vol. 68. No. 9. pp. 503-506. [23 refs.]

A brief survey of the literature is first given, and it is pointed out that some recent reports have claimed diagnostic value in finding acid-fast bacilli in thick blood films obtained by puncturing the skin, but in view of the frequency with which lepra bacilli are present in large numbers in apparently healthy skin this source of fallacy has not been allowed sufficient weight. A method of concentrating any bacilli present in 5 cc. of blood withdrawn by puncturing the antecubital vein through apparently healthy skin is described. It consists in decalcifying with citrate of soda, removing the red corpuscles and serum by centrifuging to leave only the deposited white corpuscles and bacilli, dissolving the white cells in 1 cc. of 10 per cent. antiformin and again centrifuging after adding 6 cc. of 30 per cent. alcohol, the small remaining deposits then being stained and examined for acid-fast

bacilli. Out of 23 nerve cases of leprosy 2 to 3 bacilli only were found in two cases in two hundred fields of the microscope. In 51 cutaneous cases a very small number of bacilli were found in 28 cases, but on examining slit smears of the punctured skin of the 21 vein-blood positive cases acid-fast bacilli were found in 15, which might account for the positive results in some of the vein bloods examined. He therefore concludes that lepra bacilli are very rare in the circulating blood of nerve cases, more common in that of cutaneous cases, but when found in thick films obtained by puncturing the skin they are usually derived from the skin itself. Examination of vein blood is therefore complicated and of little diagnostic value. *L. R.*

DE GRAAF (J. F. H.) & LEVIE (L. H.). Het voorkomen van zuurvaste bacteriën in het bloed bij leprapatiënten. [**Acid-Fast Bacteria in the Blood of Leprosy Patients.**]*—Nederl. Tijdschr. v. Geneesk.* 1933. Sept. 2 Vol. 77. No. 35. pp. 3955-3961. With 10 figs on 1 plate. English summary (5 lines).

Reference is made by the authors to the work of SARDJITO and SITANALA (this *Bulletin*, Vol. 29, p. 848) on the finding of leprosy bacilli not only in thick blood-drop preparations from leprosy lesions but also from the same type of preparations taken from an apparently sound finger. They have continued this investigation both for blood obtained from lesions or healthy areas of skin and for blood from a vein. The usual technique of the thick drop is followed and after dehaemoglobinization with distilled water the film is fixed with methyl alcohol. Staining is by carbol-fuchsin for 5 minutes, during which time the preparation is gently, not strongly, heated 3 times. Decolorization is effected by 1 per cent. sulphuric acid followed by 70 per cent. alcohol till no more fuchsin is removed. The preparation is now washed in water, counterstained with aqueous methylene blue 3 minutes, washed again, dried and examined with an oil immersion lens. In the case of the venous blood 3 per cent. sod. citrate is used to prevent clotting and dehaemoglobinization effected with either saponine or distilled water. As the majority of the bacilli are intracellular, within the leucocytes, the use of the leucocyte layer, obtained by sedimentation of the citrated blood, represents a concentration method. The possibility of acid fast bacilli being present in the reagents is well controlled by the authors. Other controls were also employed. Confirmation of the presence of acid-fast bacteria in the blood obtained from healthy skin areas was established. Acid-fast bacilli were demonstrated in the venous blood, that is, evidence was afforded of a bacillaemia. The greatest number of bacteria was found in the blood of cases of active nodular leprosy, few or none in the predominantly nervous type and they were absent in the "burnt-out" cases. Criteria of recognition of the acid-fast bacilli as leprosy bacilli were, (1) their occurrence in typical bundles (cigar packets) or enclosed in a zoogloea, and (2) their frequent intracellular position. The authors are very cautious over the subject of healthy carriers of leprosy bacilli. *W. F. Harvey.*

LAI (Daniel G.). Chinese Leprosy Cases in the U.S. National Leprosarium. A Clinical and Laboratory Study of 36 Patients with 7 Autopsy Reports.—*Chinese Med. Jl.* 1933. Aug. Vol. 47. No. 8. pp. 772-784. With 1 fig.

This is a brief clinical study of the 36 Chinese patients who have been admitted to Carville, nearly all originally from Kwangtung, S. China.

Of these 32 were males, 80.6 per cent were classed as mixed cases and only 8.8 per cent of the skin type. The other data recorded are in accordance with general experience. L. R.

FÉRON. Léproux tubéreux, léproux maculaires et leurs plaies [**Nodular, Macular and Ulcerous Leprosy.**]—*Arch. Méd. Gén. et Colon.* 1932. Nov. Vol. 1. No. 8. pp. 503-508. With 8 figs.

This is a short illustrated article describing the well known lesions of dermal leprosy as seen by the author in the St. Antoine leper institution in Ethiopia with its 154 patients. In treatment chaulmoogra and copper preparations are employed. L. R.

ESS (B. J.). A Case of Neuropathic Arthropathy occurring in Leprosy.—*Malayan Med. J.* 1933. Sept. Vol. 8. No. 3. p. 205.

This is a brief account of changes in the astragalo-calcaneal joint more especially resembling those of Charcot's disease and associated with loss of sensation of the nerves of the affected limb. L. R.

LABERNADIE (V.) & ANDRÉ (Z.). Essai de traitement de la lèpre par des injections intraveineuses d'huile de chaulmoogra pure (Note préliminaire.) [**Intravenous Injections of Oil of Chaulmoogra.**]—*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. p. 988.

Having found intravenous injections of chaulmoogra oil innocuous in tuberculosis the authors tried it in leprosy, and although it is too early to report the results their experience in 44 lepers shows that 1 cc. doses can be thus injected without immediate inconvenience to the patient. L. R.

EMERSON (George A.), ANDERSON (Hamilton H.) & LEAKE (Chauncey D.). Effect of Chaulmoogric Acid Derivatives on Lipolytic Activity in Vitro.—*Proc. Soc. Experim. Biol. & Med.* 1933. Nov. Vol. 31. No. 2. pp. 272-273.

—, — & —. Comparative Biological Activity of Seven New Water-soluble Chaulmoogric Acid Derivatives.—*Ibid.* pp. 274-277.

In the first of these notes chemical evidence is given for thinking that the *in vitro* lipase stimulating action of gynocardates of SHAW-MACKENZIE is not a real one. In the second note the activity of seven new water-soluble chaulmoogric acid derivatives is examined in rat leprosy and *in vitro* on acid-fast bacilli, the most promising of which is Na-dichaulmoogric-B-glycerophosphate (chaul-phosphate for convenience). It can be given intravenously like alepol. L. R.

FÉRON. Notes sur le traitement des poussées aiguës de lèpre par les injections intraveineuses de gonacrine. [**Treatment of Exacerbations of Leprosy by Intravenous Injections of Gonacrine.**]—*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. pp. 981-987. With 5 figs.

In acute exacerbations of leprosy, with fever and tumefaction of the leprous tissues, the author tried intravenous injections of gonacrine (dose not given) in view of its good effects in painful congestions of rheumatism. He records and illustrates three nodular cases of leprosy in which rapid decline of the reactions followed this treatment, and he considers that it may prevent the necessity for tracheotomy in such reactions affecting the larynx. L. R.

REFNSTIERNA (J). Premiers résultats de traitement de la lèpre par un sérum expérimental. [First Results of Treatment of Leprosy by an Experimental Serum.]-*C. R. Acad. Sci.* 1933. Oct. 2 Vol. 197 No 14. pp 718-720 Also in *Arch. Inst. Pasteur de Tunis* 1933. Nov. Vol 22. No. 3. pp 364-366

A serum has been prepared by repeatedly injecting sheep with cultures of Kedrowsky's bacillus obtained from a leper, and has been tried in two advanced cases of tubercular leprosy in Sweden. In the first case a large recent leproma soon decreased to one-third of its former size and at the end of a month a number of old lepromata had been entirely absorbed. The second patient had complicating eye trouble affecting the cornea. A score of ulcers healed after three weeks and the rest at the end of a month, while the corneal leproma had decreased in size and become less active. The treatment is being continued and it is hoped that it will assist other methods L. R.

EMERSON (G), ANDERSON (H. H) & LEAKE (C. D). Lipolytic Activity of Rat Lepromata during Treatment with Various Antileprotics.—*Proc. Soc. Experim Biol & Med.* 1933 Oct Vol 31. No. 1. pp. 18-20. [10 refs]

Changes in the lipase content of lepromata during intensive injection of antileprotic drugs into the lesions have been investigated in rats, with the result that the low lipase content of leprosy tissues, which they attribute to the great dilution of the tissues by low lipase-containing bacilli, was found not to be raised by the injection of ethyl chaulmoograte, alepol, etc They therefore think it is doubtful if the efficacy of chaulmoogra derivatives is due to an indirect stimulation of the lipolytic activity of the tissues as suggested by SHAW-MACKENZIE and ROGERS [see this *Bulletin*, Vol 30, p. 240]. L. R.

BERGMAN (R. A M.), SITANALA & SARDJITO. Een proef met het kweken van leprabacillen in culturen van leucocyten in vitro [An Experiment in the Cultivation of Leprosy Bacilli in Cultures of Leucocytes in Vitro.]-*Meded. Dienst d. Volksgezondheid in Nederl.-Indie.* 1933. Vol 22. No. 3. pp. 189-196. With 6 coloured figs. on 1 plate.

Sardjito and Sitanala have used the thick drop method to demonstrate the occurrence of leprosy bacilli in the circulating blood (this *Bulletin*, Vol. 29, p. 848, Vol. 30, p. 242). The present authors have attempted by the method of tissue culture of the leucocytes from the blood of a leper to induce growth of leprosy bacilli under conditions closely approximating to their natural surroundings, with some measure of success.

The culture medium used was the coagulated blood plasma of the leprosy patient himself and the culture material was the washed top-layer of leucocytes of his centrifuged whole blood. A hollow slide and a mica cover glass formed the apparatus for the micro-culture and microscopic examination of the incubated cultures was made daily. Control cultures of normal leucocytes were not made, but the authors enter into the question of the possibility that the appearances seen by them were artefacts. A coloured plate is given of the day-to-day appearances (Ziehl-Neelsen stain) of the cultures. These illustrations

commence with the appearance of the thick drop and show in succession (1) the acid-fast bacilli with central granule, acid-fast granule and non-acid fast granule after 48 hours incubation, (2) acid-fast bacillus, acid-fast granule, acid-fast bacillus with dark central granule, "globus" of acid-fast bacilli on the 4th day of culture, and (3) small red granules and large red floccules on the 5th day.

The authors hold that they have shown that it is possible to maintain leprosy bacilli alive in leucocyte cultures for at least six days and that still more important development might be expected with improved culture technique, such as would prolong the life of the culture.

W. F. Harvey

ARAÚJO (H. C. de Souza). Tentativas infructíferas de cultura do *Mycobacterium leprae* pelo methodo de Lowenstein [Fruitless Attempts at Cultivation of *Mycobacterium leprae* from the Blood.]—*Brasil-Médico*. 1933 Feb 25. Vol 47. No 8. pp 131-132.

This article is of value as a frank account of work carefully performed, and the details of the author's methods are stated.

Impressed by the results reported by OTA and SATO (this *Bulletin*, Vol. 29, pp. 268 and 551) the author undertook a series of tests in the last half of 1932. He obtained 26 samples of blood from 17 lepers in whom the disease was in an active stage, C₂ and C₃ of the Manila classification; some were taken in the febrile periods with a bacteriæmia. At least 12 cultures were attempted with each, and with some 24, others even 36, using the following media: those of Löwenstein, Petroff, Petragiani, Shiga's glycerine potato and glycerine broth agar. The following was the technique adopted:—

Blood was taken by venepuncture and 10 cc. was placed in a sterile tube containing 2 cc. of 20 per cent sodium citrate and strongly shaken. It was then centrifuged and the supernatant fluid decanted within 2 hours and the sediment treated with 3 per cent acetic acid to dissolve the red corpuscles; after centrifuging for 20 minutes, the supernatant was again decanted, the residue well washed with distilled water, again centrifuged, and the deposit treated with 5 per cent. sulphuric acid; centrifuged, decanted, and the deposit again treated in the same way till a pasty, chocolate-coloured mass was left for making cultures.

Daily examination of the cultures was made, some became contaminated with moulds and were discarded, but some of each group remained uncontaminated. The author states that after being studied for 6 months the cultural attempts were entirely negative: "smears of the sediment rarely showed acid-alcohol-fast organisms. 'Anxious to know whether the sulphuric acid inhibited cultures, so-called, of *Mycobacterium leprae*, I treated some strains by Shiga's method, obtained from human cases for culture. Strains of Kedrowsky, Brinckerhoff and McCoy grew freely, while those of Currie, 'Lepra 18' of the Lister Institute, Deycke, and the two varieties of Ota and Sato did not grow in any medium." NOJIMA had shown that 5 per cent. sulphuric acid killed cultures of the organism in 60 minutes, but the author's material was never exposed to it for longer than 30 minutes. Of 400 tubes examined, he found a few acid-alcohol-fast bacilli in seven, mostly degenerated forms. These occurred in Löwenstein's medium once, in Shiga's three times, twice in glycerin agar and once in glycerin broth; the cultures had been put up for periods ranging between 33 and 153 days. Attempts at subculture proved negative. He is at a loss to explain the discrepancies between OTA and SATO's results and his own. H. H. S.

MCKINLEY (Earl B.) & VERDER (Elizabeth) **Further Studies on the Cultivation of *Mycobacterium leprae*.**—*Proc Soc Experim. Biol & Med.* 1933. Nov. Vol. 31. No. 2 pp. 295-296

In this brief paper the authors state that they now find that human embryonic tissue of the liver, spleen or lung is a better culture medium than that of chick embryo recently recommended by one of them, although the former is more difficult to obtain. The leprosy nodules are digested with 3 per cent sodium hydroxide to free the organisms from the tissues, neutralized and inoculated into the tissue medium suspended in Tyrode's solution. Evidence has been obtained that the acid-fast organisms multiply through several generations [see this *Bulletin*, Vol. 30, p. 559].
L R

RODRIGUEZ (J.), MABALAY (E.) & TOLENTINO (J. C.) **Gram-Positive Forms of *Mycobacterium leprae* from Leprotic Lesions Bacteriologically Negative for Acid-Fast Organisms: a Preliminary Report.**—*Philippine Jl. Sci* 1933 Aug. Vol. 51. No. 4. pp. 617-629

The authors have applied to leprosy organisms the staining method by means of which MUCH in 1907 reported having demonstrated in tubercular material non acid-fast but Gram positive granular bacilli and granules which were virulent. The present workers examined numerous smears by both Much's and Ziehl-Neelsen's methods in Philippine lepers re-examined at regular intervals. Patients who had become bacteriologically negative were kept under observation for a year before being paroled, during which the acid-fast bacilli were less frequently found in from 45 per cent. during the first four months to 16.6 per cent. at the end of the period. On the other hand, granular bacilli were found by Much's method in 57 per cent in the first period and in 66 per cent. in the last one, and also in one-third of "closed" cases in which acid-fast ones had never been demonstrated. They believe that many of these Gram-positive forms are not merely degenerate forms, as they were numerous in "closed" or "incipient" cases of leprosy which had not undergone treatment.
L. R

- i. NODENOT (L.) & BERNY (P.) Inoculation du bacille de Hansen dans le péritoine de rats après blocage. [**Inoculation of Hansen's Bacilli into Rats.**]—*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. pp. 989-990.
- ii. TISSEUIL (J.) & ——. Inoculation du bacille de Hansen directement dans le foie des rats.—*Ibid.* p. 990.
- iii. —— & GILLIER (R.). Inoculation testiculaire de la lèpre humaine au rat.—*Ibid.* Nov. 8. No. 9. pp. 1134-1135.
- iv. GERBINIS (P.). Essais de culture du bacille de Stefansky.—*Ibid.* pp. 1135-1137.

i. In the first of these short notes L. Nodenot and P. Berny report on the intraperitoneal injection to rats of fresh emulsions of human leprosy nodules after "blockage" by first injecting a mixture of phosphates and calcium chloride. They were unable to confirm the results of CANTACUZÈNE and LONGHIN [this *Bulletin*, Vol. 30, p. 239] concerning the development of Hansen's bacillus in the peritoneal cavity of rats.

ii. Tisseuil and Berny report on the injection of Hansen's bacillus into the liver of rats with negative results.

iii. Tisseuil and Gilher report on the inoculation of human leprosy material into the testicles of rats, they found that the lepra bacilli may be preserved there up to two years, but no generalization takes place as earlier reported by BAYON

iv P. Gerbinis reports attempts to cultivate the bacillus of Stefansky of rat leprosy from the blood by the method of Lowenstein; results were negative. L. R.

AOKI (Yoshio) & MURAO (Kitoshi). Zur Brauchbarkeit des Witebskyschen Prinzips der Tuberkulose-Komplementbindungsreaktion für die Lepra. [**Employment of Witebsky's Principle in Leprosy Fixation Reaction.**]*—Ztschr. f. Immunitätsf. u. Experim Therap.* 1933. Vol. 79. No. 5/6. pp. 365-371.

The authors conclude that the Witebsky, Klingenstein and Kuhn tubercle antigen can give strong reactions with the sera of leprosy cases, and that a leprosy antigen made according to the Witebsky method can be used for the serum diagnosis of leprosy L. R.

BALIÑA (Pedro L.) & PUENTE (José J) La campaña sanitaria antileprosa en la Argentina. Plan de organización, sus conexiones e interdependencia con la lucha antivenérea.—*Semana Méd* 1933 Dec 7 Vol 40 No 49 (2082) pp 1765-1772

CONTINENTINO (Lincoln). Recomendações suggeridas para a conveniente localização e instalação de leprosarios no Brasil, segundo os princípios correntes de engenharia sanitaria.—*Brasil-Médico* 1933 Nov 25. Vol. 47. No 47 pp 833-841.

FIDANZA (Enrique P) Estado actual del tratamiento de la lepra.—*Semana Médica* 1933. Apr 20 Vol 40 No 16 (2049) pp 1325-1336

FIDANZA (Enrique P) La campaña antileprosa en Santa Fe.—*Semana Méd* 1934 Jan 11 Vol 41 No 2 (2087) pp 124-129

GOMES (J. M.) A lepra e a luz natural.—*Brasil-Médico* 1933 Aug 5 Vol 47 No 31 pp 551-553 English summary

INDIAN MEDICAL GAZETTE 1933. Oct Vol 68 No 10 pp 600-602 — All-India Leprosy Conference.

THEWLIS (Malford W.) Leprosy: Report of a Case.—*Med. Times & Long Island Med. Jl.* 1933 Oct Vol 61 No 10 p 306

YAWS AND SYPHILIS.

VAN NITSEN (R). Pian et syphilis. Caractères différentiels. [**Yaws and Syphilis. Differential Characters.**]—*Bruxelles-Méd.* 1933. June 4. Vol 13 No 31. pp 852-859 With 1 map.

An attempt to controvert the arguments of BLACKLOCK [see this *Bulletin*. Vol 30 p. 185 & 739].

Professor BLACKLOCK questioned the validity of some points, commonly given in text books, for the differential diagnosis of yaws and syphilis. Van Nitsen in turn has submitted BLACKLOCK's opinions and the arguments he used in their support to severe criticism. Many of BLACKLOCK's ingenious arguments, he states, were based upon unwarranted assumptions, others upon evidence which was very doubtful and towards these attention is drawn

BLACKLOCK in support of his opinion that yaws could be hereditarily transmitted quoted two cases of yaws in infants cited by older writers but there is no evidence that both children were not infected after birth. He propounded an idea that inheritance in yaws would only probably occur under a special set of circumstances, though the theory showed powers of imagination there was no evidence produced in support of the idea. He suggested that yaws was almost exclusively a disease of childhood and that few women suffered from yaws at a time when they might be expected to transmit the disease to the foetus. This of course is not a correct statement of fact, many women in endemic areas suffer from florid yaws during their pregnancy. The abortion rate among women so suffering is no greater than among others. Reference has already been made (this *Bulletin*, Vol. 30, p. 596) to the investigations of Wassermann, Hecht and Meinicke tests in the case of a ten-day-old infant, child of a mother suffering from florid yaws. All were negative. All the evidence in fact goes to prove in contradiction to Professor BLACKLOCK's opinion that yaws is never hereditarily transmitted.

BLACKLOCK throughout his article would try and insist that only syphilis contracted in childhood with extragenital chancre should be compared with yaws if the comparison is to be a valid one for purposes of distinguishing the two diseases. His reasons are not very apparent except that he appears to believe as above stated that yaws is seldom acquired in adult life. He fails to take the opportunity of comparing adult acquired syphilis with adult yaws and genital primary lesion, a not so very rare condition. BLACKLOCK again has attempted to make much out of some difference of opinion in the description of the yaw lesion by two writers in different parts of the world, and uses this as an argument for considering the lesion as non-specific in face of the findings of nearly all framboesialogists. The typical primary and secondary lesions of yaws are not reproduced in syphilis, and though tertiary yaws lesions may resemble somewhat those produced by other diseases such as leprosy, leishmaniasis, syphilis, etc., most of them manifest specific characters.

BLACKLOCK would believe that the characters of the "foot yaw" are caused by walking bare-foot but for this suggestion there is no evidence—the foot yaw is a lesion due to yaws and never seen in a bare-footed native syphilitic.

BLACKLOCK's ideas upon the incidence of mucous membrane lesions in yaws are based on false assumptions. While lesions of the mucous

membranes are the rule in syphilis it has yet to be proved that they occur in yaws except by extension from the skin. Yaws lesions therefore do not arise in mucous membranes.

[It may be pointed out once again that in the past lesions have often been referred to as occurring on a mucous membrane when in fact they have been on skin, the authors being ignorant apparently where skin ends and mucous membrane begins. Lack of opportunity for continuous observation in human yaws also accounts for the failure to trace, as has been done by SCHÖBL in monkeys, the evolution of what would appear to be isolated yaws lesions of the mucous membrane in the nasopharynx. SCHÖBL has shown that a lesion starting in the skin in the neighbourhood of the nostril in the monkey may "creep" along the mucous lining, spread forwards being attended by healing behind so that eventually the lesion appears isolated on the mucous membrane. It is these lesions which subsequently give rise to gangosa as was shown in the monkey.]

In regard to pruritus all will agree with BLACKLOCK that in native races subject to a multitude of skin affections this symptom is worthy of but scant consideration in differential diagnosis. On the other hand BLACKLOCK is wrong when, on the authority of a single observer who has stated that alopecia occurs in yaws, he believes this sign has no value in differential diagnosis. All other observers are agreed that alopecia occurs in syphilis and not in yaws. The fallacies underlying much that has been written concerning the occurrence of ocular, visceral and nervous manifestations in yaws are exposed. BLACKLOCK's arguments must stimulate interest but they prove nothing as regards the unity of yaws and syphilis.

Many points in the differential diagnosis of the two diseases were not touched on by BLACKLOCK, some of these van Nitsen thinks should not be left out of the discussion, namely:—

(1) The strict limitation in the geographical distribution of yaws; syphilis on the other hand being world-wide in its incidence.

(2) The biological difference in the two spirochaetes—one always reproduces yaws, the other syphilis.

(3) Though there is some experimental evidence of a crossed immunity in the two diseases in animals [with differences as pointed out by SCHÖBL] yet there is little or none to show that one disease protects against the other in man. Observations in Africa have demonstrated that past yaws does not protect against syphilis. In Tanganyika-Moero when syphilis was introduced among a people in an area where yaws was endemic they showed no immunity to syphilis. The converse is not rarely seen—persons who have had syphilis may later contract yaws.

Van Nitsen holds that the criteria used in the differential diagnosis of yaws and syphilis, whose validity BLACKLOCK has tried to assail, hold good.

H. S. Stannus.

MATTILET (G.). Syphilis et pian. [Syphilis and Yaws].—*Bruxelles-Méd.* 1933. Sept. 17. Vol. 13. No. 46. pp. 1337-1342. [16 refs.]

A paper upon the differential diagnosis of yaws and syphilis which consists of a reiteration of the points of resemblance and the points of dissimilarity of the two diseases, all of which are well known.

Among the latter are mentioned the following : The lesions produced in the monkey and the rabbit by the virus of yaws and the virus of syphilis resemble those occurring in man in the two diseases respectively and do not resemble each other

On cultivation the spirochaete of syphilis preserves its virulence for a certain time, the virulence of the yaws spirochaete is lost very rapidly. The organism of yaws is less sensitive to mercury but more sensitive to arsenic and bismuth than that of syphilis. The virus of yaws is dermatotropic, that of syphilis mesodermotropic.

In yaws the central nervous system is not affected, the cerebrospinal fluid is always normal, yaws does not cause abortion and is never transferred to the foetus; it is never inherited as opposed to syphilis. A European infected with yaws suffers from clinical yaws. The pathological changes underlying the clinical manifestations are of the same order.

Further research is necessary.

H. S. S.

BLACKLOCK (D. B.). Note sur le même sujet—*Bruxelles-Méd.* 1933. Sept. 17 Vol. 13. No 46. pp 1343-1347. [13 refs.]

Professor Blacklock replies to the criticisms of VAN NITSSEN upon his previous paper on the relationship of yaws and syphilis published in the *Annals of Tropical Medicine and Parasitology*. Both these articles received notice in this *Bulletin* (Vol. 30, p. 185 and above).

As so often happens in discussions of this kind different observers put different interpretations upon the facts as far as they are known. VAN NITSSEN'S criticism has served to draw from Blacklock however the following opinion. No one has up to the present time succeeded in proving scientifically either that yaws and syphilis are the same disease or two different diseases. Blacklock then deals in turn with the diagnostic criteria given by VAN NITSSEN, submitting each to criticism along the lines he has already used in his previous paper.

VAN NITSSEN would place Blacklock [as indeed the reviewer had done after reading the first paper] among the "*unicistes*." Blacklock now seeks to identify VAN NITSSEN with the *dualists*. Doubtless the truth is, as most of those interested in the problem would agree, that it is one that is still *sub judice* and they would prefer to speak of their opinions as based on their interpretation of what they would call the balance of evidence.

H. S. S.

HASSELMANN (C. M.). Our Present Conception of the Relationship of Yaws to Syphilis.—Reprinted from *Caduceus (Univ. of Hong-kong)*. 1932. Aug. Vol. 11. No 3. pp. 105-112.

In this paper, read before the Hong Kong Medical Society, the author reviews the relationship of yaws to syphilis in the light of the experimental results obtained by SCHÖBL and himself in the Philippine Islands. The published work of SCHÖBL has been noticed in this *Bulletin*, but the article under review forms a useful summary of some of the salient points in the problem and is worthy of reading by all those interested.

These authors find that the two treponemas give different biological reactions—the one is essentially ectodermotropic, the other shows mesodermotropism.

The regional lymphatic glands in yaws-infected monkeys only harbour treponemata so long as active yaws lesions are present;

after healing has taken place, glands transplanted into clean monkeys do not cause infection. *Sp. pertenues* does not survive and multiply in the mesodermic lymph gland, *Sp. pallida* on the other hand does survive in the glands of infected animals

The primary lesion in yaws is a papule, the treponemata are found mainly in the rete Malpighii. The typical pathological picture in the yaws lesion shows acanthosis with enormous down-growths of the rete pegs, sometimes spongiosis, parakeratosis and hyperkeratosis to a lesser degree. There is little reaction in the cutis proper. The blood vessels in connexion with the initial lesion and generalized efflorescence remain unaffected, the intima remains intact and shows no cellular infiltration nor endothelial proliferation to any extent. There is a loose cellular infiltration, with ill-defined margin, of the stratum papillare and stratum reticulare by plasma cells with but few eosinophils, round cells and fibroblasts and as a rule no giant cells, and an associated migration of leucocytes into the epidermis, sometimes with the formation of intradermal milium abscesses.

The clinical picture thus produced is a soft papilloma, slightly raised above the surface of the skin, the stratum lucidum and stratum granulosum are lost and the serum which oozes on the surface forms a non-adherent amber-coloured crust. There is no induration and no tendency to ulcerate as there is no obliteration of blood vessels.

In syphilis the initial lesion is also a papule but the treponemata are found predominantly in the corium and subcutis. There is early infiltration of the intima of the capillaries and endothelial proliferation causing obliteration of their lumina, coagulation necrosis follows and ulceration at an early stage results. The infiltration is more defined, plasma cells do not predominate as in yaws and giant cells are commoner.

The typical metastatic generalized yaw is identical histologically and clinically with the primary lesion.

In syphilis none of the subsequent skin lesions resemble the initial chancre. The primary sore in syphilis runs a definite course—papule, sclerosus, chancre, fibrosis to healing.

In yaws the primary lesion may persist throughout the whole stage of the generalized eruption and persist after it has subsided to change into a late ulcerative type of lesion, a condition probably associated with retarded immunity and the onset of allergy. In such cases the secondary eruption has usually been slight or modified. Where the metastatic crop of yaws has been prolific, rapid healing of the primary lesion usually occurs, a high degree of immunity is induced and late ulcerative lesions do not appear.

Gangosa is a late ulcerative lesion associated with the allergic state. Keratoderma plantare et palmare with the enormous hyperkeratosis, marked parakeratosis and acanthosis and but slight inflammatory reaction in the corium is also probably an allergic reaction in the specialized tissue of a particular site.

Bone lesions other than those in gangosa, which are due to direct spread, have not been reproduced in experimental animals, and their pathogeny remains in doubt.

The W.R. positive in the blood in yaws and syphilis is never positive in the C.S.F. of yaws.

Immunity is defined as that state in which inoculation with an active virus fails to produce symptoms of the disease. It varies in degree from full immunity in which multiplication of parasites is

completely inhibited and they die out, to a low grade resistance to infection in which there is a restriction of the multiplication of the organisms. Immunity, therefore, does not infer that parasites are killed immediately on inoculation.

In syphilis immunity sets in early, in yaws not for some six months. Crossed immunity develops later than homologous immunity. Crossed immunity to syphilis in a yaws-infected monkey is developed in nine or ten months.

Immunity is independent of the persistence or otherwise of lesions. A heterologous immunity to syphilis in a yaws infected native population probably is a real factor affecting the incidence of syphilis. The assertion that among the natives of Harti yaws produces visceral lesions and affections of the nervous system is incorrect as shown by the subsequent observations of Howard Fox.

In demonstrating the differences in biological behaviour of the two treponemata *Cynomolgus philippinensis*, the common Philippine monkey, is an excellent experimental animal. H. S. S.

VAN DER SCHAAR (P. J.) Entingen met framboesia bij lijders aan dementia paralytica [Inoculation with Yaws in Paralytic Dementia.]—*Geneesk Tijdschr v Nederl.-Indië* 1933. Aug. 29. Vol. 73 No 18. pp 1138-1145 [24 refs]

The inoculation of yaws spirochaetes to 40 paralytics was without result except in the only patient with negative Wassermann reaction.

The author's presentation of the subject is full of interesting information both critical and technical. It is therefore somewhat disappointing to find that, although the idea of therapeutic vaccination of a sufferer from a spirochaetal disease with spirochaete material is very reasonable, he comes to a negative conclusion regarding its present value. It is the inoculation of living spirochaetes of framboesia which forms the thesis. One great difficulty arises in the application of the method, which is the possibility of development in the syphilitic of a second symptomless infection and the doubt whether this is of any advantage to the patient. Some interesting facts emerge from the author's trials which amounted to 48 injections in 28 different persons, mainly paralytics, but among them some sufferers from cerebral syphilis. Seven strains of framboesia were used. In 41 inoculations serum was used on 40 occasions and in one case a transplant. The first 40 inoculations were negative as regards the production of any lesion but the transplant gave rise to a yaws nodule. Moreover the positive result occurred in a patient with negative Wassermann reaction; all the others had a positive reaction. This is in accordance with a previous finding of JAHNEL for syphilitic reinfection and is considered to be highly significant also for the question of the identity of yaws and syphilis. On the main subject of inoculation with framboesia the conclusion arrived at is that "the method has no application until it is known whether the symptomless superimposed infection is therapeutically advantageous for the paralytic."

W. F. Harvey

HARLEY (George W.) The Symptomatology of Yaws in Liberia.

Part I.—The Seven Cardinal Symptoms.—*Trans. Roy. Soc. Trop. Med & Hyg.* 1933. June 29. Vol. 27. No 1. pp. 99-104.

This article is in itself a summary and does not lend itself very easily to being summarized. It deals with an attempt to analyse by statistical

methods the clinical findings among 5,597 cases of what were in the first instance designated "treponematoses" met with among the native inhabitants treated at Ganta, Liberia

In these 5,597 cases, which formed 89 per cent of consecutive patients attending the dispensary, the diagnosis was made on clinical grounds and the therapeutic response to sodium potassium bismuth tartrate was observed without serological tests and as observations accumulated the diagnosis of treponematoses was abandoned in favour of yaws

The statistical analyses went to show that certain symptoms might be presumed to be cardinal symptoms of yaws. Significant associations of various pairs of these seven cardinal symptoms have been observed and the value of partial associations and correlations is pointed out. The expectancies calculated in this study are not true expectancies as records of control groups were not available. The seven cardinal symptoms are given as (1) enlarged epitrochlear glands, (2) rheumatic pains, (3) granulomata and ulcers, (4) periostitis and gross bone lesions, (5) planto-palmar dermatitis (including crab-yaws), (6) nail changes, (7) joint lesions. There was a tendency to the following groupings:—(a) Secondary granulomata and epitrochlear enlargement, (b) planto-palmar dermatitis, epitrochlear enlargement, nail changes and sometimes rheumatic pain, (c) bone changes, joint lesions, epitrochlear enlargements and rheumatic pain, (d) ulcerations with epitrochlear enlargements and sometimes bone or joint lesions. H. S. S.

HARLEY (George W.). *The Symptomatology of Yaws in Liberia. Details of the Statistical Method used in this Study.*—*Jl. Trop. Med. & Hyg.* 1933 Aug. 1, 15 & Sept. 1. Vol. 36. Nos. 15, 16 & 17. pp. 217-223; 235-242; 252-256.

In this article is given in full an analysis by statistical methods of 5,597 cases of yaws in Liberia (see above). The subject does not lend itself readily to summary and the paper should be consulted in the original by those interested in this method of study.

For the clinician the following conclusion is of importance—"Goundou and gangosa are very closely related to each other and both are undoubtedly manifestations of yaws"

The incidence of goundou and of J.A.N. was as follows:—
Goundou 18 male 22 female 1 unknown sex = 41:0.7 per cent.
J.A.N. 198 " 140 " 10 " " = 348:6.2 " "

H. S. S.

NGUYEN-VAN-TUNG. A propos d'un cas de chancre mixte extra-génital et d'un cas de chancre pianique. Les caractères cliniques du pianome primaire. [Cases of Mixed Extragenital Chancre and of Yaws Chancre.]—*Bull. Soc. Méd.-Chirurg Indochine.* 1933. May. Vol. 11. No. 3. pp. 229-236. With 1 fig.

Reports (1) a case of syphilitic chancre of the finger complicated by an infection with Ducrey's bacillus, (2) a framboesial "chancre" of the leg, with notes upon the differential diagnosis of extragenital syphilitic and framboesial chancres in Cochin China.

In the first case the lesion was situated at the base of the middle finger. Dark ground examination revealed Ducrey's bacillus but no spirochaetes were found. Vernes = 85. The epitrochlear and axillary glands on the same side were enlarged.

In the second case associated with a primary yaw on the leg there were an acneiform eruption on the face and chest and patches of what MONTEL has called "chair de poule pianique" on the back. The primary lesion contained numerous treponemata. Vernes = 45

H. S. S.

HASSELMANN (C M) **Ulcer of the Leg. Its Localization as a Point of Differential Diagnosis in Syphilis and Yaws Endemic Countries.**—*Arch Dermat. & Syph* 1933. July Vol. 28 No 1. pp. 44–52 With 5 figs. [14 refs]

The greater frequency of non-syphilitic ulcerations on the left leg has been pointed out by GOODMAN. Among 64 patients in yaws-free New York the W.R. was negative in 73 per cent. of left leg ulcers and in 40 per cent. right leg ulcers, while the reaction was negative in 85 per cent. of cases in which both legs were affected.

Among 175 cases of leg ulcer in a yaws area in the Philippines the W.R. was negative in 80 per cent. left leg ulcer, 64 per cent. right leg ulcer and 74 per cent. cases in which ulcers were present on both legs. These non-treponematous ulcers are probably initiated by trauma, possibly associated with dietary deficiency but are not due to spirochaete-fusiform infections.

H. S. S.

MONSERRAT (Carlos). **The Effect of Neosalvarsan Treatment on the Late Serologic Positive Vernes, Wassermann, and Kahn Reactions in Philippine Monkeys inoculated with Yaws or both Yaws and Syphilis.**—*Philippine Jl. Sci.* 1933 Aug. Vol. 51. No 4. pp. 435–445 With 2 figs.

This research follows on that described in this *Bulletin*, Vol. 29, p. 387—

"1. The Vernes test was found to be as sensitive a method as the Wassermann and Kahn reactions with the blood of Philippine monkeys inoculated with yaws or both yaws and syphilis.

"2. Marked serologic changes, under the influence of neosalvarsan injections, can be more easily demonstrated and evaluated by the Vernes test than by the ordinary Wassermann and Kahn methods.

"3. The Vernes reaction is a quantitative reaction and the results are more accurate than those of the ordinary Wassermann and Kahn methods, as the amount of reagin in the blood serum of infected animals can be estimated easily and more accurately by means of a photometer.

"Neosalvarsan injections produce, in the blood of infected animals, certain changes in the amount of reagin. In the Vernes reaction these changes are estimated in the photometer and expressed by figures. The combination of figures will form later the serologic curve. The serologic curve in the Vernes reaction is more regular and less fluctuating than the Wassermann and Kahn serologic curves. The changes due to the neosalvarsan injections can be detected sooner and followed more closely in the Vernes reaction than those in the ordinary Wassermann and Kahn methods.

"4. The Wassermann reaction apparently is not a good method to study the effect of neosalvarsan injections in the blood of infected monkeys on account of the various fluctuations of the Wassermann serologic curve, particularly in previously treated animals."

H. S. S.

GARCIA (Onofre.) **The Effect of Neosalvarsan Treatment on the Late Serologic Reactions of Philippine Monkeys inoculated with Yaws or both Yaws and Syphilis.**—*Philippine Jl Sci.* 1933. Aug. Vol. 51. No. 4. pp. 425-433. With 3 figs

The purpose of this research was to study the effect of neosalvarsan treatment on animals that showed strong positive late serological response beyond the limit of time previously tested [this *Bulletin*, Vol. 28, p. 443].

"The serologic curves of the Philippine monkeys inoculated with yaws or both yaws and syphilis and treated with neosalvarsan at the stage of late serologic reactions can be compared favorably with those observed in man under the same conditions.

"Of ten monkeys that were treated and had the infection for about the same length of time, those that had received previous treatment responded more promptly than those that had not received any. In the latter animals, however, there was only a gradual decrease in serologic reactivity with either the Wassermann or Kahn test during a period of two to six months of treatment." H. S. S

GARCIA (Onofre). **Duration of the Serologic Reactions in Monkeys inoculated with Yaws or Syphilis.**—*Philippine Jl Sci.* 1933 Aug. Vol. 51. No. 4. pp. 409-424.

In previous experiments it was determined that the serological picture in experimental yaws and syphilis consists of two phases, an early serological reaction coinciding with the formation of a primary lesion and a late serological response appearing about six months after inoculation and coinciding with the resistance to superinfection [this *Bulletin*, Vol. 28, p. 443]. The present paper is concerned with the duration of the late serological reactions; the conclusions are these:—

"The results obtained in the late serologic reactions of the experimental monkeys studied herewith confirm the views regarding sensitization caused by the inoculations of killed or living treponema. The strength of the serologic reaction depends on the degree of sensitization of the tissue as influenced by the extension and duration of lesions or by frequent inoculations. The degree of the serologic reaction, however, is modified by specific treatment." H. S. S.

SMITH (E. C.) & ELMES (B. G. T.). **Rosenthal Test (Microprecipitation) in Syphilis and Yaws.**—*Amer. Jl. Trop. Med.* 1933. Nov. Vol. 13. No. 6. pp. 595-598.

The authors record a comparative analysis of the results obtained by the Rosenthal and Kahn tests on 1,000 sera, using for the former the technique described by TULIPAN and DIRECTOR.

Attention is drawn to the value of a test which can be performed rapidly, using a minimum amount of blood, necessitating a simple technique only and therefore can be carried out under the more difficult conditions imposed by tropical practice.

[For method of preparation of the antigen see *Bull. Hyg.*, Vol. 7, p. 448, TULIPAN & DIRECTOR.]

Results were as follows:—

Rosenthal		Kahn							
126 strong positive	gave	53	++++	52	++++	17	++	3	+
256 positive	"	38	++++	114	++++	78	++	14	+
166 weak positive	"	8	++++	28	++++	54	++	39	+
85 doubtful	"	2	++++	3	++++	7	++	13	+
367 negative	"	0	++++	3	++++	8	++	20	+

H S. S

HASSELMANN (C M) **Immunity in Treponematoses in the Light of Experimental Evidence and Epidemiological Phenomena.**—*Chinese Med Jl.* 1933 June. Vol 47 No 6. pp 584-586

A short paper read before the China Medical Association dealing with the theory of immunity in the treponematoses as developed by SCHÖBL and himself and already summarized in this *Bulletin* H S. S

CHU'AN-K'UEI HU & FRAZIER (Chester N). **A Study of Subcutaneous Nodules of the Juxta-Articular Type observed in Five Cases of Syphilis in North China.**—*Chinese Med. Jl.* 1933 Apr. Vol. 47. No. 4 pp 364-378. With 4 figs. on 2 plates. [48 refs.]

A paper giving the clinical data pertaining to five patients, all males, four Chinese and one Pole, encountered in the Peiping Union Medical College Hospital during the six years 1925-1931 presenting J.A.N., histological descriptions of biopsy material and observations made in connexion with experimental animals.

All the patients had signs of syphilis and the W R was positive in each case. Further the nodules responded to antisyphilitic treatment in all. The histological picture was not considered characteristic of syphilis. No organisms were demonstrated in the nodules but *Sp. pallida* was recovered from a node in one case by rabbit inoculation though failure occurred in a second case

In the absence of yaws the authors believe that in these cases the nodules were truly syphilitic in origin, and that syphilis is a common cause, among others, of J.A.N. H S. S.

NOBL (G.). Zur Kenntnis der juxtaartikulären Knotenbildung (Jeanselme). [Formation of J.A.N.]—*Dermat. Woch.* 1933. July 8. Vol. 97. No. 27. pp. 1008-1012. With 1 fig.

Two cases of typical J.A.N. are described in males aged respectively 40 and 53 years and the pathological findings given. In one there was a doubtful history of syphilis, in the second a history of treated and cured syphilis. The author believes that the assumed syphilitic aetiology in these cases occurring in temperate climate is not justified by the histories obtained and the pathological pictures found.

H. S. S.

TOMIKAWA (Ryozi). "Nodosités juxta-articulaires." [J.A.N.]—*Fukuoka-Ikwadaigaku-Zasshi (Fukuoka Acta Med.)*. 1933. Aug. Vol. 26. No. 8. [In Japanese pp. 1473-1481. With 6 figs. [28 refs.] German summary pp. 81-84.]

The author describes two cases of J.A.N. in natives of Japan, these being with that of ARAMAKI the only three cases so far recorded in that country. In case 1 the condition was associated with a syphilitic

polyarthritis and positive W.R. In the second, a woman, there was no history of syphilis and W.R. was negative. Neither had been in the tropics. The histological picture resembled that already described by others. Spirochaetes were not found. H. S. S.

COSTE (F.), SAENZ (A.) & COSTIL (L.). Bacilles acido-résistants dans une nodosité juxta-articulaire [**Acid Resistant Bacilli in a J.A. Nodule.**—*Bull. et Mém. Soc. Méd. Hôp. de Paris.* 1933 Nov. 27 49th Year. 3rd Ser. No. 29. pp. 1369-1373.

The case of a male, aged 60, suffering from a rheumatoid polyarthritis who exhibited symmetrical J.A.N. just below each elbow, in one of which were demonstrated acid-alcohol-fast bacilli non-pathogenic to guineapigs.

The nodules, one on each side, were excised: cholesterol content 2.32 gm per kilo fresh tissue, urea content 0.086, therefore not a tophus. W.R. negative, therefore not syphilitic. One node presented the well-known characters of J.A.N. The other contained a small caseous area which included many acid-alcohol-fast bacilli. These failed to grow on egg asparagin medium and failed to infect guineapigs. There was a bead of pus at point of inoculation containing the same bacilli and this pus failed to infect guineapigs.

Under the circumstances the authors call the organism a paratuberculosis bacillus and they believe it caused the caseous focus in the nodule but they agree that the question whether they play any part in causing J.A.N. is quite another matter. H. S. S.

NATTAN-LARRIER (L.) & GIRARD (G.). Etude histologique des nodosités uratiques des Hovas. [**Histology of the Uratic Nodules of the Hovas.**—*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. pp. 1083-1088. With 4 figs. on 2 plates.

The histological picture found in nodules removed from two natives of Madagascar which the author describes as "nodosités uratiques des Hovas" and for which he proposes the name uratoma (urotome).

The occurrence of these nodules about the joints of the hands and in the pinnae was pointed out by FONTOYNONT, GIRARD & WOLTZ [see this *Bulletin*, Vol. 28, p. 935] under the designation of J.A.N., a use of the term which was not justified as remarked by MONTEL [*loc. cit.* Vol. 30, p. 597]. They are nodes associated with a high blood uric acid content (14 cgm. per litre) of otherwise unknown aetiology rather resembling those of chronic gout, occurring in young adult natives of the high plateaux of Madagascar.

The nodules were the size of hazel nuts. The superjacent skin showed no changes save absence of hair follicles and diminution in the number of sweat glands. The subcutaneous tissue was somewhat thickened and the cells rather larger and more numerous than normal with mononuclear perivascular infiltration. The node consists of a fibrous poorly vascularized capsule with no leucocytic infiltration, but showing a considerable number of distended lymphatics within which lies a second layer of tissue containing few fibres but rich in cells and vessels and deposits of sodium urate. The cells are swollen and irregularly formed, rounded or elongated connective tissue cells of fibroplastic type, others are plasma cells with large highly staining nuclei; there are also a good many giant cells irregularly disposed and uneven in size, polymorphic and containing up to twelve nuclei.

There is a rich network of capillaries whose endothelium shows considerable hyperplasia sufficient in many places to block their lumens, and many visible lymphatic channels filled with mononuclear cells. Some mononuclear cells, a few eosinophilic cells often in little masses, but rare polynuclear cells are also noted. Scattered through this tissue deposits of sodium urate occur; running to these deposits trabeculae are seen made up of flattened connective tissue cells, sometimes in two layers like endothelial cells, carrying with them newly formed blood vessels. The centre of the nodule contains a magma of sodium urate lying in loculi formed by processes of the inner cellular layer of the envelope. Midst this amorphous material are little masses of crystalline urates, 50–90–180 μ in diameter. These will be seen to be undergoing changes towards the amorphous state. There are also masses of cholesterol sometimes in the central mass but more often more peripheral nearer the cellular layer, or along the interlocular trabeculae.

No organism was detected but injection of the contents of nodules on two occasions tubercularized guineapigs, a result which is looked upon as incidental.

H. S. S

BUTLER (C S.). *Yaws and Syphilis*. [Correspondence]—*Jl. Amer Med. Assoc* 1934 Jan 13. Vol. 102 No 2 p 148.

Apropos of Professor BLACKLOCK's article in this *Bulletin* [Vol 30, p. 739] "Yaws and Syphilis, Two Diseases or One," Captain Butler complains that his contributions on this subject, a list of which he gives, have not been cited. "The English authorities" he writes, "are unwilling to acknowledge the good work of American investigators." Captain Butler is mistaken, English workers do not overlook the work of Americans, or any other nation as far as it is accessible to them, indeed, of 40 references given by BLACKLOCK 10 came from American journals.

It may be added that BLACKLOCK does not claim to have "proved the proposition that yaws and syphilis are the same thing." What he has done is to call for reconsideration of the general opinion that they are different.

A. G. B.

GIUNTA (Giuseppe). Sulla trasmissione della *Framboesia tropica* Nota epidemiologica.—*Ann d'Igiene*. 1932. Nov. Vol 42 No. 11. pp. 767–769

VAN DER SCHAAR (P. J). *Framboesia cerebri*? en *framboesia ossis* [GANTER (M R.)]—*Geneesk Tijdschr. v Nederl-Indie* 1932. Mar 1. Vol. 72 No. 5 pp 269–276 With 3 figs on 1 plate.

AMOEBIASIS AND DYSENTERY.

AMOEBIASIS.

EPSTEIN (G. V.). [Materials on the Epidemiology of Amoebiasis.]—*Med. Parasit. & Parasitic Dis* Moscow [1933] Vol. 1. No. 5-6. pp. 200-234 With 1 plate & 5 graphs. [16 refs.] [In Russian.]

This is a critical review of the works of various authors on the epidemiology of amoebiasis, with special reference to symptomless carriers of *Entamoeba histolytica*.

During the last few years a number of observations have been made on the incidence of this parasite in the population of different parts of the Soviet Union. Since the majority of the publications are in Russian the results obtained are summarized in the following table:—

Locality					No. of cases examined	Percentage of <i>E. histolytica</i> infections
Leningrad	...	...	..	...	1,404	25.3
Kola Peninsula	...	..	...	...	900	60.6
Azerbaijan	...	..	..	.	1,146	32.5
Armenia	...	..	..	...	?	17.7
Georgia	...	...	.	...	570	32.3
Turkistan	...	...	..	..	1,064	25.0-40.0

These figures are based almost exclusively on single examinations of stools. Of the total number examined in Leningrad there were 280 cases with digestive trouble, 60 per cent. of the *E. histolytica* carriers were healthy subjects, while among the others there were only 2 cases of typical dysentery; 50 per cent. of the "carriers" were local inhabitants who had never left Leningrad.

In 1929, 255 cases of summer diarrhoea were examined in that town, and 14.2 per cent. of these proved to be *E. histolytica* carriers. The figures for the Kola Peninsula are particularly interesting, since the whole of this region is within the Arctic Circle. About half of the cases examined were Russians, the other half being Lapps, Finns, Samoyeds and Zyrians. Amongst the 900 persons examined there was not a single case of dysentery. The author recognizes three species of *Entamoeba* producing 4-nucleated cysts: the larger pathogenic *E. histolytica* and the smaller *E. dispar* and *E. hartmanni*, which are harmless commensals. In analysing the statistics for "carriers" recorded in various parts of the world the author concludes that the only cosmopolitan 4-cysted amoebae, distributed from pole to pole, are the two last-named species. *E. histolytica* is, according to him, limited to warm countries, all cases of true amoebic dysentery found in temperate regions being traceable to imported cases of infection with this parasite.

C. A. Hoare.

- i. EPSTEIN (G. V.) & ZERTCHANINOV (L.). [On the Distribution of Intestinal Protozoa among the Population of the Ural Region.]—*Med. Parasit. & Parasitic Dis.* Moscow. [1933] Vol. 1 No. 5-6 pp. 235-237 [In Russian.]
- ii. PESHKOV (M.). [Intestinal Protozoa in the Russian and Bouriat Population of the Selengin Aimak.]—*Ibid.* pp. 237-239. [In Russian.]
- iii. TER-MATEVOSSIAN (C. M.). [Materials for the Study of the Protozoal Fauna of the Human Intestine in Armenia.]—*Ibid.* pp. 243-245 [In Russian.]
- iv. DEMINA (N.). [On the Human Intestinal Protozoal Fauna in Soukhoum.]—*Ibid.* pp. 245-246 [In Russian.]

In these papers are reported the results of examinations of the population in various parts of the Soviet Union for intestinal protozoa. The diagnosis was in all cases based on the examination of the stools. The findings can be summarized in tabular form as follows:—

Authors	Locality	No of cases examined	Infection rate per cent.							
			<i>Entamoeba histolytica</i>	<i>E. coli</i>	<i>Endolimax nana</i>	<i>Iodamoeba butschlii</i>	<i>Dientamoeba fragilis</i>	<i>Trichomonas hominis</i>	<i>Chilomastix mesnili</i>	<i>Giardia intestinalis</i>
1	Ural region	726	4.8*	20.5	14.8	14.6		0.2	3.0	11.8
11	Selengin** district (Siberia)	422		8.55	4.5	4.26		0.23	0.47	9.47
111	Armenia	1,200	13.8-20.6	32.0-57.0	12.0-17.4	14.3-22.3	2 cases	15.0-31.5	7.0-13.8	8.2-24.0
iv	Soukhoun (Caucasus)	398	1.26	+***	+	+		+	+	4.5

* According to the author's interpretation, this figure comprises *E. hartmanni* 2.7 per cent., and *E. dispar* 2.1

** The population of this district is composed of Russians and Bouriat; the rate of infection in the latter was found to be $1\frac{1}{2}$ times higher than in the former.

*** The exact number of cases infected with this parasite and of those in the other columns marked + is not stated

C. A. Hoare.

GAISKAYA (E. L.). [Distribution of Amoebiasis in Andijan.]—*Med. Parasit. & Parasitic Dis.* Moscow. [1933.] Vol. 1. No. 5-6. pp. 240-242. [In Russian.]

The examination of various groups of the population of the town of Andijan (Uzbekistan, in Russian Turkestan) revealed the following incidence of amoebic dysentery: out of 586 hospital patients with intestinal symptoms there were 146 (24.9 per cent.) cases, 65.7 per cent. being chronic, and 34.3 per cent. with acute dysentery. Amongst the 1,185 inmates of a hostel for worker-students there were 118 (9.9 per cent.) cases. The examination of 463 factory workers revealed 182 (39.2 per cent.) cases.

C. A. Hoare.

PARONI (Giuseppe) Amebiasi in Modena e Provincia. Casi autoctoni e casi importati. (Tesi di specializzazione) [**Amoebiasis in Modena.**].—*Giorn. Ital. di Malat. Esot. e Trop.* 1933. Sept. 30. Vol. 6. No. 9. pp. 227-228, 231-234, 237.

More than two-thirds of this article is devoted to an account of *histolytica* infection in general, its geographical distribution, and the history of the development of knowledge as to its characters and pathogenicity. The last part deals with the prevalence of amoebiasis in the town and province of Modena as gauged by an investigation carried out at the Institute of Colonial Pathology during the academic year 1932-33.

Among patients living in the town itself the author found 24 whose homes were in 17 different streets and two others whose place of residence was not determined—26 in all. In the Province he found 49 from 17 different localities, a total of 75 cases. This is not the first time that cases have been recorded in this Province, for in the course of examinations of faeces carried out at the Institute in 1930-32 there were 29 positive specimens from 11 individuals. H. H. S.

WAKESHIMA (Tadasu) & KOO (Chiden). **Examinations for Intestinal Protozoa, with Special Reference to the Carriers of *Entamoeba histolytica*, in North-Formosan Rural Communities.**—*Taiwan Igakkai Zasshi* (*Jl. Med. Assoc. Formosa*). 1933. July. Vol. 32. No. 7. (340). [In Japanese pp. 1034-1038. [21 refs.] English summary p. 93.]

The stools of 139 people were examined once only, by simple smear method in Donaldson's solution. The protozoa were found in encysted form only. *Entamoeba histolytica* 11.51 per cent; *E. coli* 13.67; *Endolimax nana* 2.88, *Iodamoeba bütschlii* 1.44; *Giardia intestinalis* 2.16. H. M. Hanschell.

BIGGAM (A. G.) & GHALIOUNGUI (Paul). **Amoebic Liver Affection: Symptoms and Treatment, with a Review of 25 Cases.**—*Jl. Trop. Med. & Hyg.* 1933 Sept. 15. Vol. 36. No. 18. pp. 270-275.

This paper is a careful analysis and review of 25 cases of amoebic involvement of the liver.

The rarity of its occurrence in females is stressed—in the authors' view this is not influenced by alcohol or nature of food, but rather by less exposure to and occurrence of amoebic intestinal infection. The average case age was 35, but amoebic abscess of liver was found in one 3 months old patient. In only 52 per cent. of cases was there history of dysentery. Fever was often absent. Average leucocyte count was 17,000, polymorphonuclears 70 per cent., lymphocytes 22 per cent., hyalines 5 per cent., eosinophils 1 per cent. In three cases the abscess extended to lung; in three to parietes; one ruptured into the peritoneal cavity.

The authors emphasize the importance of subcutaneous injection of emetine. They describe two cases where liver abscess developed during other recognized methods of treatment of intestinal amoebiasis. If the condition of the patient allows of delay, emetine injection prior to aspiration is advisable. To ascertain the effect of emetine on the myocardium blood pressure records should be made daily. The point to select for aspiration is the point of maximum tenderness.

Examination of pus at time of aspiration proved valuable in determining the line of treatment. Numerous pus cells and bacteria make open operation advisable. In some cases, however, despite presence of a few pus cells and bacteria, aspiration with emetine injections brought about cure.

H. M. H.

LUND (Charles C) & INGHAM (Thomas R). **Four Fatal Cases of Unsuspected Amebiasis. Preliminary Report on One Aspect of the Recent Chicago Epidemic.**—*Jl. Amer. Med. Assoc.* 1933. Nov. 25. Vol. 101. No. 22. pp. 1720-1722.

The amoebic nature of the infection in these four fatal cases was not recognized in time for treatment to be effective. The infection was probably received from carriers working in the kitchen of a Chicago hotel. These cases were among a number of other cases of acute colitis occurring among 125 members of the lumber trade who met in conference in Chicago. In all cases the symptoms began after the meeting was over and its members scattered all over the U.S.A. and Canada.

H. M. H.

REEVES (Robert J.) & APPLE (Elbert D) **The Use of Thorium Dioxide in the Diagnosis of Liver Abscess.**—*Jl. Amer. Med. Assoc.* 1933. May 27. Vol. 100. No. 21 pp. 1682-1683. With 2 figs.

The authors claim that the report of this case will serve to illustrate the value of hepatolienography as an aid to diagnosis of liver abscess.

The patient complained of pain in the right upper abdomen. The diarrhoeic stools revealed *E. histolytica*. Thorium dioxide was given in 12 cc. doses by intravenous injection, with a total dosage of 72 cc. over a period of fourteen days. Three days after the last injection X-ray examination disclosed a markedly enlarged liver and a large rounded area of diminished density situated in the posterior portion of the liver. This abscess was aspirated and 300 cc. of pus evacuated. [The X-ray photo shows the abscess in unusually well defined outline.]

H. M. H.

POINDEXTER (Hildrus A.). **The Puerto Rican Strain of *Endameba histolytica*. Comparison of the Diagnostic Value of Direct Smear Examination and Cultivation with Pathogenicity Test.**—*Puerto Rico Jl. of Public Health & Trop. Med.* 1933. Sept. Vol. 9. No. 1. pp. 31-36. [Spanish version pp. 37-43.]

This paper records preliminary work directed to explain the anomaly of a high carrier incidence of *E. histolytica* in Porto Rico with a low incidence of clinical amoebiasis.

The explanation the author thinks must lie within one of three categories: (a) the endamoebae of Porto Rico though morphologically and in some respects culturally resembling *E. histolytica* are not really the pathogenic species that cause acute amoebiasis; (b) the people being long in contact with the specific protozoa and having a high incidence of infestation with the closely related protozoa, have developed some degree of specific as well as group immunity; (c) the high carbohydrate diet of the Islanders tends to decrease the activity of the endamoebae without interfering with their life cycle.

The author found experimentally that cultural and microscopical examination of Porto Rican strains of *E. histolytica* revealed a high positive correlation. The cultural method was superior because in doubtful cases *E. histolytica* may be more easily differentiated from *E. coli* in the vegetative stage than in the encysted stage. The Porto Rican strain of vegetative *E. histolytica* showed less pathogenicity in kittens fed on a high carbohydrate diet, than the United States strain injected into the kittens of same age fed on a high protein diet. Puppies fed on high carbohydrate diet tolerated the infection, even though some showed active trophozoites in the stools for several days.

H. M. H.

ACTON (H. W.). *Entamoeba histolytica* Carriers and their Treatment. —*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. July 28. Vol. 27. No. 2. pp. 119–126.

The author classifies carriers into three definite types:—

1. Coprozoic carriers with no lesions and no symptoms
2. Pathogenic carriers with lesions and slight symptoms.
3. Mixed carriers which have also bacilli of the dysentery group

The routine treatment was administration of bismuth emetine iodide. Most of the failures occurred in the mixed carrier group, and for these a preliminary of autogenous vaccine was given—the vaccine prepared from the causative organism of the bacillary infection. Carbarsone tried on 50 carrier cases has given good results.

H. M. H.

CHOPRA (R. N.), SEN (B.) & SEN (S.). Treatment of Chronic Intestinal Amoebiasis with Carbarsone.—*Indian Med. Gaz.* 1933. June. Vol. 68. No. 6. pp. 315–319.

Carbarsone (4-carbamino-phenyl-arsinic acid) is a white crystalline solid containing 28.85 per cent. of arsenic. The compound is amoebicidal. It is given in doses of 0.25 gm ($3\frac{3}{4}$ grains) in gelatine capsules twice daily.

In a series of 31 cases, here reported, a ten-day course cured 23 patients; 4 remained indeterminate, and 4 remained uncured. The proportion of probable cures to failures in this series was 5.75 : 1, as compared with 3.5 : 1 obtained by KNOWLES in a similar series with emetine bismuth iodine, and 3.16 : 1 obtained by ACTON and CHOPRA with kurchi bismuthous iodide. Carbarsone produced no untoward effects in the doses administered.

H. M. H.

FITZGERALD (G. H.). Gavano. A New Specific for Amoebic Dysentery. —*Indian Med. Gaz.* 1933. Aug. Vol. 68. No. 8. pp. 458–459.

This paper reports satisfactory immediate results of treatment by gavano in 3 cases of amoebic dysentery and one case of hepatic abscess. The drug was given by mouth, one 0.25 gm. tablet twice daily.

Gavano is a new Bayer synthetic preparation, claimed to have specific action on *E. histolytica*; to produce no vomiting; to be far less toxic than emetine (therapeutic index tested on cats is 1 : 3); no cumulative action; acts on medullary centres causing lowering of

blood pressure and diminished CO_2 elimination, with increase of vagal activity and increase of peristalsis of large intestine

Gavano has proved to be remarkably effective in treatment of amoebic dysentery in cats
H. M. H.

DAVID (N. A.), JOHNSTONE (H. G.), REED (A. C.) & LEAKE (C. D.).
The Treatment of Amebiasis with Iodochlorhydroxyquinoline (Vioform N.N.R.).—*Jl. Amer. Med. Assoc.* 1933 May 27. Vol. 100 No. 21. pp. 1658–1661.

This paper records the success of Vioform N.N.R. in treatment of amoebiasis.

The authors state that Chiniofon N.N.R., which is sodium iodo-hydroxyquinoline sulphonate, has been widely exploited under various trade marked names ("yatren," "anayodin") as a relatively non-toxic and supposedly efficient amoebicide. They protest that this compound was selected for clinical exploitation without any demonstration of its advantages over other halogenated oxyquinolines.

The authors claim that the clinical trial of Vioform N.N.R. in human amoebiasis is justified on the results of its experimental chemotherapeutic comparison with Chiniofon N.N.R. A total dose of 15 grams given orally in two courses of 0.75 gm. daily for ten days with a week's rest between clears the stools of *E. histolytica* in an average case. It is dispensed in capsules of 0.25 gm. each.

In 47 unselected cases of human amoebiasis administration of Vioform N.N.R. in the dosage recommended resulted in clinical cure in 38 cases, as determined by frequent stool examination during three to six months follow up. No evidence of toxicity was noted in any patient.
H M H.

ST. JOHN (J. H.) **The Effect of Emetin on *Endamoeba histolytica* in Culture.**—*Amer. Jl. Hyg.* 1933 Sept. Vol. 18. No. 2. pp. 414–432. With 5 charts.

By using a special heart broth medium of low protein content to which wheat starch was added, and in which *Entamoeba histolytica* grew readily, the author has determined that emetine kills the amoebae from ten to fifty times more readily when the medium is kept alkaline than when it is acid.

In a dilution of one in a million it killed the amoebae regularly in two to three days in alkaline medium, while in the case of two or three strains death occurred in three or four days with a dilution of one in five million.
C. M. Wenyon.

ANDREWS (Justin), JOHNSON (Carl M.) & SCHWARTZ (Seymour C.).
The Use of Fecal Extracts in the Cultivation of *Endamoeba histolytica*.—*Amer. Jl. Trop. Med.* 1933. Nov. Vol. 13. No. 6. pp. 591–593.

By mixing one part of human faeces with 4 parts of Ringer's or Locke's solution or physiological saline to which serum was added, and then straining and filtering to remove bacteria, an extract was obtained which, added to certain culture media, favoured the growth of *Entamoeba histolytica*. The extract does not deteriorate in 4 weeks at room temperature but is rendered inert by boiling though not by heating at 60°C. for 30 minutes. The action of the substance does not rest on any change in the growth of bacteria.
C. M. Wenyon.

- FRYE (William W.) & MELENEY (Henry E.). Studies of *Entamoeba histolytica* and Other Intestinal Protozoa in Tennessee: VI. The Influence of the Bacterial Flora in Cultures of *E. histolytica* on the Pathogenicity of the Amoebae.—*Amer. J. Hyg.* 1933 Nov. Vol. 18. No. 3 pp. 543-554

Though it is well known that injection of cultures of *Entamoeba histolytica* into the large intestine of kittens will frequently give rise to amoebic dysentery, the part played by the bacteria or other substances present in the medium has never been determined. In the experiments recorded in this paper, the authors have found that the frequency with which dysentery is produced is greatly reduced if before injection the amoebae are washed free of most of the bacteria and other material by centrifuging in serum-Ringer solution. Though injection of the washings free from amoebae did not produce dysentery it is concluded that the bacteria or other substances present in the media play a part in the production of lesions. Nevertheless, there still exists a difference in pathogenicity between different strains of amoebae.

C. M. Wenyon.

- DASPECT (M.) & JONCHÈRES (H.). Action favorisante de l'hémoglobine sur la culture d'*Entamoeba dysenteriae* [**Haemoglobin in Cultivation of *E. histolytica*.**].—*Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26. No. 8. pp. 995-999.

- DESCHIENS (R.). Influence des hématies et de l'hémoglobine des mammifères sur les cultures d'amibes dysentériques.—*Ibid.* pp. 999-1002.

If instead of adding egg albumin or horse serum to the liquid part of media for the cultivation of *Entamoeba histolytica* there is substituted solution of haemoglobin to give a strength of 0.5 to 2 parts per litre the growth of the amoebae will be improved

C. M. Wenyon.

- ALEXEIEFF (A.). Phagocytose chez l'*Entamoeba histolytica*. [**Phagocytosis in *E. histolytica*.**].—*Bull. Soc. Path. Exot.* 1933. July 12. Vol. 26. No. 7. pp. 909-913. With 1 fig.

The author has observed the ingestion of red blood corpuscles by *Entamoeba histolytica* and finds that the whole process occupies but some fraction of a second. The corpuscle in contact with the amoeba is as it were suddenly sucked through a small opening which constricts it to a dumb-bell shape during its passage to the endoplasm. In movement forwards the amoeba either glides with or without an ectoplasmic pseudopodium or progresses by means of an axial cytoplasmic current in the direction of movement and peripheral currents in the reverse direction. In the cytoplasm can be seen micro- and macro-somes enclosed in small vacuoles. Often at the posterior end of an amoeba are large vacuoles formed by an active process of engulfing droplets of water, a kind of hydropagocytosis.

C. M. Wenyon.

- SIMIC (Tsh.). L'infection spontanée et expérimentale du chien par l'*Entamoeba coli*. [**Natural and Experimental Infection of the Dog with *Ent. coli*.**].—*Ann. Parasit. Humaine et Comparée.* 1933. Sept. 1. Vol. 11. No. 5. pp. 329-338.

Having found during certain experiments with young dogs that one animal had a natural infection with *Entamoeba coli*, and that another

animal injected *per rectum* with human material containing *E. dispar* (*E. histolytica*) and *E. coli* became infected with both these amoebae, the author attempted to infect 25 other dogs under two months of age. Human material containing *E. coli* was either fed to the animals or injected *per rectum*. Four of the dogs contracted the infection. Both methods of administering the material succeeded. The infection, which was quite innocuous, lasted at most seven days.

C. M. Wenyon.

BACILLARY DYSENTERY.

SOULE (M. H.) & HEYMAN (Anne M.). **Bacteriological and Serological Study of 89 Cases of Dysentery in which *B. dysenteriae* Flexner and *B. dysenteriae* Castellani-Sonne were isolated as the Causative Agents.**—*Jl. Trop. Med. & Hyg.* 1933. Oct. 2. Vol 36. No 19. pp. 281-289. [80 refs]

The title of this article describes exactly the outcome of the investigation, which utilized exact morphological, cultural and serological tests for identification of the organisms isolated. The outbreak was in Michigan.

An interesting point which emerges in the discussion is "that plain agar medium . . . gave excellent results in the differential study of the colonies," although the authors "ordinarily select eosin-methylene-blue or Endo's medium for this type of work." A grouping was made of the cultures on the basis of fermentation reaction, colony type and serological response. These types do not correspond to those of THJØTTA. An acute epidemic comprising 89 cases furnished the material. Of these 84 patients were under 8 years of age and 64 less than 2 years old. In their summary, the authors give as their results that:—"Type I appears to be identical . . . with *B. dysenteriae*, Flexner, . . . occurring in 26 cases, eight of which terminated fatally. Type II corresponds, colony formation excepted, to *B. metadysenteriae* Castellani and is identical with *B. dysenteriae* Sonne. Members of this group were isolated from 17 cases . . . severe . . . but not fatal. Type III, based on fermentation reactions, the members of this group are very closely related to *B. morgani*. However, from the observation that this type was present in four of the fatal infections in which the Flexner organism was the causative agent, it is considered that Type III is a variant of Type I."

W. F. Harvey.

FARRAN-RIDGE (C.) & LUSH (Dora). **A Bacteriological Investigation of Asylum Dysentery occurring at Mont Park.**—*Med. Jl. Australia.* 1933. Dec. 2. 20th Year. Vol. 2. No. 23. pp. 743-745.

It is most necessary, in the domain of preventive medicine, to assess the degree of efficacy of stock measures instead of being content with the general statement that they are considered to be efficacious. The most important part of this communication is the intimation of a trial of prophylactic vaccine with the proper alternate-case, unvaccinated controls and—be it noted—in anticipation of the appearance of the expected annual outbreak. A preliminary research has been made to determine the organisms locally concerned with this scourge of all asylums, asylum dysentery. Two types of organism were isolated, *Bact. dysenteriae* (Flexner) and *Bact. dysenteriae* (Sonne). The vaccine contained 75 per cent. of the former and 25 per cent. of the latter and a

strength of 1,000 million organisms per cc. Three doses of 0.5, 1 and 1 cc. "have been given at seven-day intervals to about 160 patients in wards especially liable to infection, an equal number being left unvaccinated as controls"

W F Harvey

SHIGA (K) Zur Einteilung und Benennung der Dysenteriebazillen
[Classification and Nomenclature of the Dysentery Bacilli].—Zent.
f Bakt. I. Abt. Orig 1933. Nov. 1. Vol. 130. No. 1/2.
pp 1-11.

The proposal of the discoverer of the most outstanding of the dysentery bacilli ought to be entitled to special respect. His proposal is for unification of types. On the whole the grouping made and the names allotted are simple and the claims of priority are also taken into consideration. The following table makes this clear and is self-explanatory:

Classification of Dysentery Bacilli

According to Lentz	1 Shiga-Kruse bacillus	2 Schmitz bacillus	3 Flexner Group			4 Kruse-Sonne bacillus
			Flexner	Y	Strong	
Litmus Mannite	blue	blue	red	red	red	red
Indole	—	+	+	±	±	+
Milk	no coagulation	no coagulation	no coagulation			coagulation
Litmus lactose	blue	blue	blue			red
Special toxin	+	—	—	—	—	—
According to Shiga	(1) B dysent	(2) Bacillus metadysenteriae				(3) B paradysent.

In the grouping made by Shiga the metadysentery bacilli closely resemble the dysentery bacillus, differing from it in the absence of specific toxin formation, their fermentation of mannite, their indole formation and specific agglutination. The Schmitz bacillus is a form transitional between *Bact. dysenteriae* and *Bact. metadysenteriae* as regards fermentation of mannite. The paradysentery bacillus is separated from the dysentery bacillus by lactose fermentation, which characteristic places it between the colon bacillus and the metadysentery bacillus. Shiga, therefore, proposes that the dysentery bacilli should be divided into groups named (1) dysentery, (2) metadysentery, and (3) paradysentery.

W. F. Harvey.

DES ESSARTS (J. Quérangal). Le bactériophage dans une épidémie de dysenterie bacillaire. (Applications thérapeutiques et prophylactiques.) [Therapeutic and Prophylactic Use of Bacteriophage in Epidemic Dysentery].—Bull. Soc. Path. Exot. 1933. Oct. 11. Vol. 26. No. 8. pp. 979-981

An account is given of very successful results from a Shiga-Flexner bacteriophage treatment of an epidemic of bacillary dysentery amongst naval cadets on training ships at Brest.

This bacteriophage was obtained from a special laboratory and consisted of controlled strains mixed with strains isolated from the stools of convalescents. Altogether 185 cases were treated. Each patient coming from the epidemic area and showing glairy, bloody stools was given 5 cc (about 25,000 million) to drink in a glass of alkaline water, 10 cc on each of two following days and 5 cc. on the 4th day, without any other medication. Soon after ingestion the symptoms subsided and no bacilli could be cultured from the stools 24 hours later, by which time the stools also showed the presence of phage. Cure was rapid and neither complications nor relapses presented themselves.

An example is also given of the use of the bacteriophage prophylactically in young children by dosage with 2 cc. for 4 days. This was successful, as judged by the absence of any attacks in the population treated, although dysentery was prevalent in the neighbourhood.

W. F. Harvey.

MIXED AND UNCLASSED

RATCLIFFE (Herbert L.) Intestinal Lesions associated with Amebic and Balantidial Infection in Man and Lower Animals.—*Amer. Jl. Hyg.* 1934 Jan. Vol. 19 No 1. pp. 68–85 With 15 figs. [22 refs.]

A study of invasion of the intestinal wall by balantidia in the capybara and by amoebae in swine suffering from hog cholera has shown the author that in both cases this is preceded by lesions of the surface initiated by some cytotoxic or necrosing substance elaborated by the protozoa. There was no evidence that the ciliates or amoebae advanced in the tissues before necrosis had occurred.

The extension of the tissue necrosis may be due in part at least to bacteria which invade the primary necrotic areas. Direct extension of the necrotic area may give rise to deep ulcers which, however, may also be formed by rupture of bacterial abscesses of the lymph follicles. By the examination of intestines at varying intervals after death of the host it has been determined that post-mortem penetration will account for organisms isolated or in groups deep in the intestinal wall. The ciliates are able to invade cut edges of the large intestine at autopsy.

C. M. Wenyon.

HEGNER (Robert). Specificity in the Genus Balantidium based on Size and Shape of Body and Macronucleus, with Descriptions of Six New Species.—*Amer. Jl. Hyg.* 1934. Jan. Vol. 19. No. 1. pp. 38–67. With 55 figs. [30 refs.]

The number of recorded species of *Balantidium* has been steadily increasing, the sole justification for a new name being frequently the discovery in a new host. On the other hand, many have been recorded without names. It is increasingly evident that some standard data are required for differentiating species.

The author, after examining a number of species and the descriptions of others, believes that in certain cases characteristics involving the shape and size of the body and macronucleus are sufficient to distinguish one species from another provided that at least ten typical specimens are available for study. In other cases it may be necessary to study infections in the natural or experimental hosts or to undertake

cultures commenced from single individuals. The data from these sources* will eventually be forthcoming but as a preliminary step the author describes the results obtained by the process of measurement. He goes into these in detail and points out that they have led him to the creation of six new species, viz, *Bal. philippinensis* from *Macacus philippinensis*, *Bal. wenrichi* from *Ateles geoffroyi*, *Bal. cunhamunzi* from *Cebus variegatus*, *Bal. cameli* from *Camelus bactrianus*, *Bal. marsupialis* from *Didelphus marsupialis etensis* and *Bal. struthionis* from *Struthio camelus*.

Amongst the results obtained are indications that the domestic pig probably harbours two species, *Bal. coli* and *Bal. suis*, the former of which is indistinguishable from the ciliates from man and the chimpanzee
C. M. Wenyon.

NELSON (E. Clifford). **The Feeding Reactions of *Balantidium coli* from the Chimpanzee and Pig.**—*Amer. Jl. Hyg.* 1933. July. Vol. 18. No. 1. pp 185–201. With 1 text fig. & 5 figs. on 1 plate. [20 refs.]

With cultures of *Balantidium coli* from the chimpanzee and pig tests were made with a number of substances to discover what was most actively ingested. It was found that the ciliates took in and digested starch most readily and after it red blood corpuscles. This observation is in agreement with the claims that infections with the ciliate can be eradicated by reducing the starch of the diet and that rats are more readily infected experimentally when on a diet rich in carbohydrate.

C. M. Wenyon.

HEGNER (Robert). **Effects of Environmental Changes and Disinfectants and Antiseptics on *Trichomonas hominis* in Culture and in Faeces.**—*Amer. Jl. Hyg.* 1934. Jan. Vol. 19. No. 1 pp. 22–37 [14 refs.]

Employing a medium containing Loeffler's dehydrated blood serum and sodium chloride for the cultivation of *Trichomonas hominis*, the author has found that the best growth is obtained at 37°C. when the salt is at a concentration of 0.75 per cent and the serum at 0.5 per cent. At lower temperatures, even 6°C., growth will occur, but more slowly. The addition of faecal extracts to the medium favours multiplication of the flagellates, but the cultures come to an end more rapidly. As regards disinfectants, both iodine and chlorine added to cultures in the strengths advocated for sterilizing drinking water failed to kill the organisms, probably because of their combination with organic matter. Both of these reagents in stronger solutions, as also picric acid, mercurchrome, dihydranol and formalin, the last in a concentration of 0.2 per cent., are effective. When 20 cc. of 0.5 per cent. formalin was mixed with 20 gm. of infective faeces the trichomonas were no longer viable in 5 minutes.

C. M. Wenyon.

HEGNER (Robert). **The Effects of a High Vegetable Protein Diet on the Trichomonad Flagellates of Rats.**—*Amer. Jl. Trop. Med.* 1933. Sept. Vol. 13. No. 5. pp. 535–538.

The feeding of rats on various diets has shown that both vegetable and animal protein are unfavourable to the development of trichomonad flagellates, the former being only a little less active in this direction than the latter.

C. M. Wenyon.

SANCHIS BAYARRI (V). Contribución al estudio de la lamblisis intestinal en la región valenciana [*Giardiasis in the Valencia Region.*].—*Crónica Méd* Valencia 1933 July 15 Vol 37 No 796 (3rd Ser No. 67). pp. 493-501 With 4 figs

The paper draws attention to the frequent occurrence of lamblia infection in the district of Valencia, especially in children Treatment by regulated diet and administration of stovarsol or treparsol has given good results
C M Wenyon.

BUTTIAUX (René). La lamblase intestinale dans le nord de la France. [*Giardiasis in the North of France.*].—*C R Soc Biol* 1933 Vol 114. No. 38 pp 1173-1174

The author is of opinion that infections with lamblia have been increasing in number in the north of France during the past four years and that steps should be taken to control this extension It is amongst the mining population, recruited largely from Poland, that the greatest number of cases occur
C. M. Wenyon.

TER-MATEVOSSIAN (C. M.) & TSATURIAN (A. T.). [*Case of Infection with Isospora belli.*].—*Med. Parasit & Parasitic Dis.* Moscow. [1933.] Vol. 1. No 5-6. pp. 249-250. With 1 fig. [In Russian.]

The authors record a case of coccidiosis (*Isospora belli*) in a child 5 years old, from Erivan (Caucasus). The patient had been suffering from diarrhoea a fortnight before its stool was submitted for examination. In the faeces were found unsegmented coccidial oocysts, cysts of *Entamoeba coli* and *Ascaris* eggs, and later *Trichomonas* and *Chilomastix* The child continued passing oocysts during the next six days, after which santonin was administered. This treatment resulted in the discharge of about 6 *Ascaris*; the stools became normal, but solitary oocysts could still be found during the week following treatment. The sporogony of the parasite was followed up to the final stages, and it proved to be *Isospora belli* Wenyon, 1923.

C. A. Hoare.

ASHER (Maurice) & KRAEMER (Manfred). Amebiasis in Northern New Jersey.—*Amer. Jl. Med. Sci* 1933. Sept Vol. 186. No. 3. pp. 409-413. [14 refs]

DE ASSIS (Arlindo). Sobre uma variedade sorologica dos bacillos dysentericos do typo Schmitz (var. "Caxambu").—*Brasil-Medico*. 1933. Sept. 9. Vol. 47. No. 36. pp. 635-640. German summary.

BOYERS (Luther Musson). The Liver in Chronic Human Amebiasis—its Relative Size.—*California & Western Med.* 1933. Oct. Vol. 39. No. 4. pp. 239-241. With 1 fig. & 3 charts.

BUNDESEN (Herman N.), RAWLINGS (Isaac D.) & FISHBEIN (Wilham I) The Health Hazard of Amebic Dysentery. Report of an Outbreak.—*Jl. Amer. Med. Assoc.* 1933. Nov. 18. Vol. 101. No. 21 pp. 1636-1638.

BURKE (G. T.). Chronic Amoebic Infection as a Cause of Ill-Health.—*Indian Med. Gaz.* 1933. Oct. Vol. 68. No. 10. pp. 565-567.

CIBILS AGUIRRE (Raúl) & SAUBIDET (Enrique J) Consideraciones sobre tres casos de enterocolitis amebiana.—*Semana Méd.* 1933. Aug 31. Vol. 40. No. 35 (2068). pp. 608-612, [46 refs.]

- DUMONT (R) Considérations diverses au sujet de l'épidémie de dysenterie bacillaire, 1931-1932, dans le Kwango (huileries du Congo Belge) et modalités de traitements—*Ann Soc Belge de Méd Trop* 1933 Oct 30 Vol 13 No 3 pp 261-266
- McKITTRICK (Leland S) Amoebic Abscess of the Liver without Preceding Diarrhea Case Report—*New England Jl of Med* 1933 Dec 21 Vol 209 No 25 pp 1280-1281
- PARONI (Giuseppe). Amebiasi in Modena e Provincia casi autoctoni e casi importati—*Arch Ital Sci Med Colon* 1933 Nov 1 Vol 14 No 11 pp 712-720 With 1 fig English summary (2 lines)
- SCANNELL (David D) A Fatal Case of Amoebic Dysentery Preliminary Report—*New England Jl of Med* 1933 Dec 7 Vol 209 No 23 p 1171
- STRONG (Richard P) The Treatment of Amoebic Dysentery—*New England Jl. of Med* 1933. Nov 23 Vol 209 No 21 pp 1071-1073 [11 refs]
- TONNEY (Fred O), HOEFT (Gerald L) & SPECTOR (Bertha Kaplan) The Threat of Amebiasis in the Food Handler—*Jl Amer Med Assoc* 1933. Nov 18 Vol 101 No 21 1638-1639
- TRABAUD (J) Amibiase et système vago-sympathique—*Bull Acad Méd* 1934 Jan 23 98th Year 3rd Ser Vol 111 No 3 pp 142-144
- TROWELL (H C) Observations on Dysentery in Nairobi With Bacteriological Notes by F P G DE SMIDT—*East African Med Jl* 1933 Dec Vol 10 No 9 pp 265-275
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REVIEWS AND NOTICES.

HERMANS (E. H.) **Framboesia tropica.**—*Acta Leidensia (Scholae Med Tropicae)*. 1931 Vol. 6 168 pp With 37 figs. on 10 plates. [426 refs]*

The author observes that in gathering "all that is known at the present time" about framboesia he is actuated by the consideration that the clinical picture of the disease may presently be modified by the therapeutic attack upon it which is everywhere being made, in case this attack should have the effect of exterminating yaws within a short period of time—which the author does not believe to be possible—his work, he hopes, will have an historical value.

The volume begins with a chapter on historical aspects of the disease. Those who are interested in older comments on the framboesia-syphilis problem will find in this monograph a number of references to publications, especially in Dutch, which are not readily accessible and which are not very frequently quoted, there are 426 publications cited under Literature.

A geographical survey forms the second chapter, at the end of which the author gives an "incomplete list of the names used in various countries for framboesia", the number of names given amounts to over fifty.

The primary stage, the secondary stage, sole and palm framboesia, and tertiary stage, each occupy a chapter. Tertiary affections of the skin, bones, joints and internal organs, and rhinopharyngitis mutilans, juxta-articular nodules and goundou, are next dealt with in order. The last chapters are on immunity and serum reactions, popular medicines and beliefs, and therapy.

In answer to the question "Are syphilis and framboesia the same disease?" which forms the heading of Chapter XVI, the author summarizes his previous chapters in short sections, at the end of each of which his own conclusions are added. The author's final conclusions are as follows:—

"Gathering all our arguments and knowledge together I consider that we have every right to look upon lues and framboesia as two different diseases. It is now not difficult to ascertain whether lues or framboesia or both occur in a certain district. And as far as we can look back into history we find these two diseases alongside each other, the one never passing over into the other. The fact that framboesia is only a tropical and lues a cosmopolitan disease is of essential importance.

"As far as I can judge I should think it only confusing to look upon lues and framboesia as one and the same thing. The fact that in certain cases striking similarity may exist is not of course of any scientific value.

"On the other hand we cannot be blind to the many points of similarity which exist between the two diseases, and it is not impossible that framboesia and syphilis have generated from one and the same form of disease."

D. B. Blacklock.

UNION OF SOCIALIST SOVIET REPUBLICS. **Wissenschaftliche Literatur der UdSSR, 1928. Systematischer Anzeiger der Bücher und zeitschriftlichen Aufsätze. Medizin.** [Scientific Literature of the U.S.S.R., 1928. Medicine.]—pp. xxii + [739] + lxxvii 1931. Moscow.

The comprehensive cataloguing of the scientific literature of the world, a project generally recognized as desirable, requires as a

* Copies may be obtained at the Leiden Institute of Tropical Medicine (Rapenburg 33, Leiden) price 6 shillings.

beginning that countries shall undertake to collect by local organization the material relating to their own national literature. Once national bibliographies are available, their bringing together to form an international record of the world's scientific output becomes possible. Working on these lines the organizers of the "International Catalogue of Scientific Literature," before the European War of 1914-18, had set up regional bureaux in various co-operating countries to collect titles of original contributions to scientific literature published within their national boundaries. The conditions resulting from the War brought this international organization to an end in 1915, and unfortunately most countries have allowed the cataloguing of their scientific literature to lapse. Soviet Russia is an exception, for, as an essential part of their second five-year plan, the All-Union Central Executive Committee of the U S S.R. established Commissions to compile indexes of current Russian literature, including the literature of science and agriculture.

The volume under review, which is one of a series of volumes relating to Russian scientific literature, contains a bibliography of Russian medical literature published during 1928. The main part of the work, including brief abstracts of the more important papers noted, is in Russian, but the classified list of contents and the titles of papers are given also in German for the convenience of non-Russian users. Entries are grouped so that papers on like subjects are brought together, and there are alphabetical authors' and subject indexes. In all 231 Russian medical journals have been indexed and 11,012 titles of medical papers published in Russia during 1928 have been noted. In comparison with other European countries, the size and complexity of the U S S.R. make the task of compiling yearly indexes of its scientific literature a gigantic one. Friends of the Soviet Union will claim that successful achievement is made possible by reason of the form of socialized Government within the Union, in which scientists and doctors are State officials and scientific and medical publications are part of the machinery of State. Whatever view is taken, the preparation of such national bibliographies of scientific literature is a service to the progress of science that other Governments might well copy. R. L. S.

BUREAU OF HYGIENE AND TROPICAL DISEASES.

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BERIBERI AND EPIDEMIC DROPSY.

A REVIEW OF RECENT LITERATURE.

By A Douglas BIGLAND, M.A., M.D, Ch.B., M R C.P.

Sectional Editor, Tropical Diseases Bulletin.

(Received March 14, 1934)

The last review of this subject (P W. BASSETT-SMITH) appeared in this journal in 1921. The present survey, based for the most part upon papers summarized in the *Tropical Diseases Bulletin*, covers the period 1921-1933. In addition to the large amount of recent research upon beriberi the difficulty of presenting a general account of the subject in a small space is increased by the inclusion of epidemic dropsy in the discussion. This latter condition has recently received so much attention that no review would be complete without a consideration of its relationship to the beriberi syndrome.

Rice-eating peoples are prone to suffer from a condition of oedema which is frequently epidemic and not connected with the usual cardio-renal causes. As pointed out by MEGAW¹ the condition in one extreme presents the syndrome of epidemic dropsy (fever, rash, gastrointestinal symptoms, capillary dilatation, glaucoma, etc.) and at the other extreme the picture of chronic beriberi with peripheral neuritis. While admitting that in the intermediate stages the two conditions may overlap and closely resemble one another, there can be little doubt that at either extreme beriberi and epidemic dropsy are distinct and separate clinical entities, and as such they will be regarded in this review.

BERIBERI.

Etiology.—Evidence is still collecting confirming the view that beriberi is a vitamin B deficiency disease associated with the over-milling of rice. Thus, CAZANOVE² has shown that in Cochín-China the beriberi hospital admissions in 1916 were 988 with 197 deaths, while in 1928 there were 3,425 admissions with 600 deaths. It is claimed that this increase is due to prosperity in the western provinces causing the natives to substitute polished rice for the coarser variety. FUKUSHIMA³ reports that beriberi incidence in the Japanese navy in 1912 was 1 per 1,000, while in 1919-1921 the figure rose to over 4.

This was apparently due to an increase in the white rice ration which was later again reduced with beneficial results. LICHTENSTEIN⁴ states that in 1918 the issue of unpolished rice to the Dutch East Indian army was stopped, with the result that the beriberi incidence rose from 1.8 per 1,000 in 1918 to 26 per 1,000 in the first eight months of 1922. According to ALBERT & OCAMPO⁵ the infantile beriberi hospital admission rate in Manila fell from 7.79 per cent in 1915 to 0.45 per cent in 1927, and this improvement is due to the issue of Tikitiki extract (made from the pericarpal layer of rice grain) on a large scale to the poorer classes. The recommendations of the Far Eastern Association of Tropical Medicine congresses in 1923 and 1925 clearly support the vitamin deficiency theory. Such examples can be multiplied, together with suggestions for the public control of a standard rice issue (VEDDER & FELICIANO⁶ and others).

On the other hand, McCARRISON⁷, whose large experience must command full consideration, is not satisfied that vitamin deficiency is the sole agent in the causation of beriberi. He points out that though rice-eating races are widely distributed throughout India endemic beriberi is confined to certain well-defined and narrow areas, especially in Madras, and has been so for the last hundred years. Strict rice-eating Hindus in these areas suffer less than those classes which do not restrict themselves to rice. Millet-eaters here, too, suffer from beriberi, but not elsewhere. The disease originates only in those jails which are situated in the endemic area, though the diet is the same throughout all the Madras jails. From such considerations he holds the view that two factors are in operation in the causation of beriberi: (i) a nutritional, or intrinsic, factor, and (ii) an unknown extrinsic factor peculiar to certain tracts of country or to certain individuals. As regards the first factor he finds that it is rice relatively less deficient rather than relatively more deficient in vitamin B which is responsible for the human disease. GRAHAM⁸, dealing with McCARRISON's work, develops this view. He states that supposing the figure 100 represents the amount of vitamin B necessary to keep pigeons in health on any given diet, then true beriberi will occur at figures 75-90, while a figure of 50, or lower, will cause polyneuritis columbarum. Thus, true beriberi is due to insufficiency rather than complete absence of the necessary factor.

Some confusion seems to have arisen regarding how far one is justified in quoting animal experiments in support of beriberi etiological views. Very large numbers of such experiments have been conducted, but the work of McCARRISON and GRAHAM appears to clarify the position. Polyneuritis columbarum and true beriberi in pigeons are two distinct conditions. In the former the heart is atrophied, while in the latter cardiac hypertrophy and degeneration are present. The condition of the heart is considered to be the essential distinguishing feature. It may be added that various endocrine changes have been recorded in avian beriberi (KORENCHESKY⁹ and others).

The extrinsic toxic factor postulated by McCARRISON is of metabolic rather than microbial origin, but a considerable amount of research has been carried out on the possible association of a micro-organism with beriberi. In this connexion the work of BERNARD¹⁰ must receive attention. This worker claims that beriberi is an acute febrile illness and that peripheral neuritis, with or without oedema, only occurs later in the cases that survive. The chronic picture of the disease, he thinks, is too often regarded as that of true beriberi by

those who identify experimental B-avitaminosis with the human condition, in other words, what is usually regarded as beriberi is only a sequel of a previously contracted toxi-infection. BERNARD has isolated an organism, *B. asthenogenes*, which he claims is an etiological factor of importance. Animal experiments, complement fixation tests, etc., support this view, but two additional etiological factors are demanded, viz., a gastro-intestinal condition favouring the action of the organism and a lowered resistance resulting from faulty diet. If one of these factors is absent, even though the other two are present, beriberi does not result. PONS and BOREL¹¹ confirm the presence of positive complement fixation tests with *B. asthenogenes* in human sufferers. CANNON¹² supports BERNARD'S views as regards toxi-infection and faulty diet, but he includes another factor—endocrine disturbance.

In 1929 MATSUMURA¹³ described a "beriberi bacillus" resembling *B. coli communior*. This bacillus was isolated from the intestines in experimental animals and from the faeces in 74 per cent. of human sufferers. Positive agglutination tests were obtained. From these results it is claimed that the bacillus is the principal etiological factor in experimental beriberi. PARREIRAS¹⁴ and DE ARAUJO¹⁵, both working in Brazil, are opposed to the view that Matsumura's bacillus is a specific organism for beriberi, while PAVY¹⁶ supports the contention.

The possibility of there being a toxin in rice itself has received little consideration. OHMORI¹⁷ attempted to prove that cold alcoholic extracts of rice contain a toxic substance, while ACTON and CHOPRA^{18,19} have shown that damaged grain may be classified as "epidemic dropsy rice" and "beriberi rice" according to whether water-soluble toxins or alcohol-soluble toxins predominate.

To sum up this section it may be stated that the consensus of opinion is that beriberi is associated with vitamin B deficiency, but that another factor, probably of a toxic nature, is also present.

Pathology.—The view expressed by SHATTUCK²⁰ that it is not possible either in the laboratory or at autopsy to demonstrate a conclusive criterion of beriberi may once have been true, but the cardiac findings in typical cases may be regarded as diagnostic. These will be referred to later. TULL²¹ reports that thickening of the wall of the gall bladder is a constant feature in beriberi.

Important in this section is a consideration of the mechanism of symptom-production in beriberi. The water-retention theory was first put forward in 1928 by MEBIUS^{22,23} and WENCKEBACH²⁴. They showed that oedema occurs in the heart muscle, chiefly intracellular in site and affecting the anisotropic substance of the muscle fibre. Excess of water interferes with the normal fluid exchange and consequently with contractility. The control of osmotic pressure depends upon the presence of vitamin B, and all the other symptoms of beriberi can be explained by water retention. DE LANGEN²⁵ considers that disturbance of lipid metabolism is responsible for the symptoms of the disease. FINDLAY²⁶, too, suggests that vitamin B is an essential factor in the synthesis of animal nucleic acid by the body. On the other hand, WALSH²⁷ disagrees with this view because there is no proof that chromatolysis indicates nuclear starvation or that it causes paralysis. Without doubt, water-retention in beriberi is of the greatest importance in elucidating the mechanism of symptom production.

Clinical.—It can safely be assumed that in countries where beriberi is endemic for every actual sufferer from the disease there must be

many more who are constantly living upon the brink of nutritional trouble. Such a pre-beriberi state has not received, as yet, all the consideration it deserves. In a most interesting paper GREY²⁸ points out that in deficiency diseases there is not only the question of the accessory factor but also of the factor to which it is accessory. In Japan the diet is unbalanced, being low in protein value and high in starch content, but the amount of vitamin B may be sufficient for ordinary conditions. With the advent, however, of such adverse conditions as excessive heat or humidity, lack of exercise, fatigue or intoxications beriberi may develop without any change of diet. During July, August and September in Japan a state of malnutrition passes abruptly into one of beriberi. Thus, in the Central Telephone Exchange, Tokyo, visited by Grey in June 1927, out of 500 female employees 80 were incapacitated from work by a condition which was regarded as beriberi or about to be beriberi. Showing how widely spread deficiency disease is in Japan the following report is of interest: out of 207,939 sick in the Japanese army in 1923, 82,429 were found to be suffering from nutritional disorders. Grey is also of the opinion that mouth-breathing, defective eyesight and the common habit among Japanese of preferring to sit at work and falling asleep in public conveyances are all symptoms of under-nourishment. THIERFELDER-THILLOT²⁷ has observed that the more chronic cases of beriberi develop among those who have experienced partial vitamin deprivation for some time, while the acute malignant cases are found where there is a sudden change from a normally balanced diet to vitamin deficiency. In 1928 BRAY²⁹ reported that a large part of the high infantile mortality in the island of Nauru, a mandated territory in the Pacific, is due to vitamin B deficiency, and that saturation of babies with the necessary vitamin brought about recovery from gastro-enteritic, pneumonic and meningismic symptoms in a few hours. COWGILL³⁰ from experiments on dogs has clearly shown that deprivation of vitamin B causes loss of appetite, and he quotes the work of MORGAN and BARRY to show that shortage of this factor may bring about restriction of growth in American school children.

Considerations of the condition known as infantile beriberi have been prominent in recent literature. The importance of the subject can be realized from the fact that in the Philippines 16,500 deaths occur annually from this cause (about 28 per cent. of total deaths among infants under one year). Most of the cases occur in breast-fed infants, but exceptions are recorded. Most observers maintain that the mothers of such infants are themselves sufferers from beriberi, but according to ALBERT³¹ in 25 per cent. of cases no symptoms nor signs of the disease can be found in the mother. Clinically, the picture resembles the adult type with oedema and cardiac failure but apparently neuritis (except for that of the laryngeal nerves, causing aphonia) is usually absent. Nevertheless, Albert is emphatic in his belief that infantile beriberi is not the adult form in miniature, but a distinct entity. The remarkable effect of tikitiki extract in lessening the mortality rate is referred to elsewhere.

The most important advances in the clinical study of beriberi are undoubtedly those dealing with cardiology. In 1928 WENCKEBACH³² gave a full description of the heart in beriberi; from the onset of the disease the right side of the heart is enlarged, and the same is true of the left side but to a less extent. There follows a rapid increase in the size of the heart, chiefly of the right side, with cardiac failure. This is

confirmed radiologically and also clinically by a peculiar "wriggling fluttering" of the apex beat. Increasing stasis leads to hepatic enlargement, engorgement of the venae cavae, ascites, and even sudden death. There is never any disturbance in the fundamental cardiac rhythm, and electrocardiograms reveal only slight right ventricle preponderance. The pulmonary circulation shows no stasis. For treatment the ordinary cardiac tonics are useless and administration of vitamin B is the only remedy. At autopsy there are no signs of inflammatory change in the myocardium, and the cause of the condition as already mentioned, is a failure of muscular contractility due to water-retention.

The most serious complication of beriberi is sudden heart failure, called by the Japanese *shōshun*. This also has received very full consideration from WENCKEBACH³². The condition is especially liable to occur in young subjects who are apparently well and able to walk about, and thus peripheral neuritis with its obligatory inactivity is a safeguard in this respect. The onset is sudden with acute distress and severe pain in the chest and upper abdomen. Sudden death is likely to occur. A clear post-mortem picture of the condition was obtained by injecting bodies with formalin immediately after death. Enormous enlargement of the right heart with great engorgement of the large veins and liver are constant features. In one of WENCKEBACH'S cases so great was the distension of the right auricle that the blood could be seen through the stretched wall. The right ventricle is found to form practically the whole of the heart when viewed anteriorly, and the right conus arteriosus is markedly curved forwards (pathognomonic of the condition).

In 1931 AALSMEER³³ described what is now known as the "adrenalin effect," viz., a marked fall in diastolic blood pressure (practically to zero) after the injection of adrenalin in beriberi patients. This fact is a useful diagnostic criterion, and can be used as a guide in assessing the value of any particular form of treatment. In this respect beriberi resembles aortic regurgitation and exophthalmic goitre. Recently, AALSMEER³⁴ has pointed out that the adrenalin effect as a test for the continued activity of beriberi may fail owing to decompensation of the left heart. Administration of cardiazol shortly before the adrenalin injection acts as a stimulant to the left heart, and the full adrenalin effect will then be obtained.

Treatment and Prophylaxis.—Assuming that the eating of polished rice is a factor of the greatest importance in the causation of beriberi one would naturally think that the disease could be quickly and easily stamped out by simply supplementing the diet with vitamin-rich food or by consuming only unpolished rice. Unfortunately the customs and tastes of human beings cannot be changed by legislation. Thus, many years ago unpolished rice was issued to the army in the Dutch East Indies as a prophylactic measure, but in 1918 this had to be stopped because the native soldiers refused to eat it. EIJKMAN³⁵ truly points out that everywhere the difficulty is recognized of supplying a sufficient quantity of vitamins in a palatable form to a rice-eating population if only polished rice is available. The claim of JANSEN and DONATH in 1926 that they had isolated pure vitamin B from rice bran should be of the greatest importance in this respect. They found that 1 part of this substance in 500,000 parts of washed polished rice protects *Munia maja* (a finch) against polyneuritis. COHEN & AZIR³⁶ have treated

beriberi patients with this product and striking results were obtained. In shôshin the effect was regarded as life-saving.

The excellent results obtained in the Philippines from the administration of tikitiki extract have already been mentioned. This preparation is an alcoholic extract made from the pericarpal layer of rice grain and it is issued by the Public Welfare Board in large amounts. According to BELMONTE³⁷ the dosage is as follows: to mothers, in addition to a balanced diet, a tablespoonful of the extract is given after meals, for babies 3-4 teaspoonsful a day are sufficient in mild cases, but in severe cases 5-7 teaspoonsful a day are necessary. In the Dutch East Indies DE VOGEL³⁸ has described similar work. There the Public Health Authorities issue rice husk vitamin in four forms:— (1) *tablets*, each containing 7.5 gm. of rice husk absorbed by kaolin, 1-3 tablets a day protect an adult, eating completely decorticated rice, while for treatment 8-12 tablets are necessary. (2) *Extract of anti-beriberi vitamin*. A daily dose of 1-10 cc. is sufficient for adult protection. (3) *A powder*—similar to the tablets. (4) *Ampoules* (2 cc.) Each of these contains 1 mgm. of vitamin which is the daily adult dose. Later, VAN VEEN³⁹ found that the above doses had to be increased somewhat, and he points out that toxic effects may sometimes follow the injections. Satisfactory results have also been obtained from the use of various oryzanin preparations and from Wenckebach's "eviuinis." In short, a consideration of recent literature reveals the fact that the prophylaxis and treatment of beriberi is largely a matter of dietary supplements in one form or another.

As might be expected, various drugs have been tried and in a paper by TOURNIER⁴⁰ a very formidable list of these will be found. PAVY⁴¹ claims that urotropin is a specific in beriberi. He states that with a dose of $7\frac{1}{2}$ grains 4 times a day cure can be expected in 15-21 days. AALSMEER⁴² has obtained good results with Lugol's iodine solution when a vitamin-rich diet has failed. The similarity between the adrenalin effect in Basedow's disease and beriberi suggests the presence of thyroid dysfunction also in the latter. In the treatment of sudden heart failure, as has been already pointed out, the usual cardiac tonics fail, and adrenalin is definitely harmful since it causes a marked drop in diastolic blood pressure (already low in beriberi) and an increase in the venous pressure. According to WENCKEBACH³² pitressin raises the diastolic blood pressure in beriberi from almost zero to 75-90 mm. and the venous pressure suddenly falls. This beneficial effect may last from 25 minutes to $1\frac{3}{4}$ hours. On the other hand, AALSMEER⁴² finds that pitressin is not always successful in cases of shôshin, because the relief of the right heart may throw a sudden burden on the left heart which it is not able to bear. He quotes one case where death occurred immediately after a pitressin injection. Venesection must not be forgotten as a valuable aid in the relief of cardiac failure in beriberi.

EPIDEMIC DROPSY.

The greater part of the research work on this condition, which has only recently received much attention, comes from India. The history of the disease in Calcutta reveals some interesting epidemiological features. According to MAZUMDAR⁴³ epidemic dropsy first appeared in Calcutta in 1877 and two following years. With the exception of a small outbreak in 1901, no further cases were reported until 1907 when an epidemic, on this one occasion associated with peripheral neuritis, occurred. In 1909 the number of deaths from this

cause was 433 (Hindus 336, Mahomedans 77) The epidemic of 1919 was responsible for 96 deaths, the mortality being three times greater among Hindus than Mahomedans, and four times greater in females. In the epidemics of 1926 and 1927 there were 939 and 630 fatal cases respectively. In 1930 there were 68 deaths and in 1931, 52.

As regards the etiology of epidemic dropsy there seems to be fairly general agreement that rice when faultily stored, especially when exposed to excessive heat and moisture, develops toxic properties. A good example of the way in which this may occur is recorded by SARKAR and GUPTA⁴⁴. One day a boatload of rice arrived at a certain populous village in the Noakhali district. The rice was distributed to various people and no cases of epidemic dropsy occurred except in the household of a certain Dr Nath. This family stored its rice in a dol besmeared with cow dung on the outside and kept in a damp room. After about seven months, when the last portion of the rice at the bottom of the dol was being consumed, the whole family, including the doctor himself, developed the disease. The same rice stored in earthen vessels previously soaked in mustard oil and also the remainder of the rice bought by other people was harmless. It appears, therefore, that in the grain, owing to long storage in damp conditions, a saprophytic organism had become pathogenic. MEGAW & BANERJI⁴⁵ described two similar family outbreaks in which the severity of the disease was proportional to the amount of rice eaten and in which recovery followed abstention from it. Similarly MEGAW & BHATTACHARJEE⁴⁶, in investigating an outbreak consisting of 70 cases in a small quarter of Calcutta, found that the only factor common to all was parboiled rice which had been stored for about one year. On the other hand, a study of an outbreak in Allahabad (BANERJI⁴⁷) revealed the following etiological facts. The disease was practically confined to Bengalese, while Mahomedans entirely escaped. The Bengalese live on rice, fish, vegetables cooked in mustard oil, fresh fruits, etc., but they have been accustomed for generations to carbohydrate excess which is not true of the Mahomedans. It is suggested that this may account for the remarkable difference in vulnerability of the two races. It was also reported in this epidemic that several members of a family were affected one after another even when rice had been prohibited, and there were three families attacked in which no rice at all had been eaten for a month previously. GHOSH⁵² who investigated the same epidemic states, however, that those Bengalese who ceased to take rice, or changed to the local hand-milled variety, escaped and that the brunt of the epidemic fell upon those who bought their rice from one particular market.

DUTT⁴⁹, basing his views upon 1,700 cases, is convinced that the food-toxin theory of etiology is false. He is of the opinion that the disease is a manifestation of intestinal sepsis depending upon the presence of a specific micro-organism. He gives three reasons in support of this view: (1) throughout the disease there is a leucocytosis which lessens during convalescence and disappears with complete cure. (2) A doctor infected himself while operating upon an epidemic dropsy patient (Col. MEGAW, however, suffered no ill effects after inoculating himself with 3 cc. of serum from another patient). (3) The disease is immediately checked and ultimately cured by a powerful antiseptic, such as colloidal gold in the presence of nascent chlorine.

In 1927, cases of epidemic dropsy began to occur among Indians in Fiji (SAGAYAM⁵⁰). The rice consumed by them was imported but it

was shared by Fijians and Chinese none of whom contracted the disease. It was supposed, therefore, that mustard oil was responsible. Both BANERJEE⁵¹ and GHOSH⁴⁸, investigating an epidemic in Bengal, came to the same conclusion. BOSE⁵³ opposes this view because the disease broke out in a jail in Upper Burma where no mustard oil was used, and also because in Calcutta the Makwaris who never take mustard oil are among the sufferers. More recent opinion seems to be that mustard oil has nothing whatever to do with the causation of epidemic dropsy. The same is true of vitamin deficiency. One more etiological fact may be mentioned, viz., no infantile form of the disease is described. To sum up this section, it may be stated with some confidence that epidemic dropsy, unlike beriberi, is not associated with vitamin deficiency but rather with some unknown toxic factor found among rice-eating peoples and possibly having its origin in grain which has been stored under unsatisfactory conditions.

The post-mortem findings in epidemic dropsy are most interesting. DE⁵⁴ describes extensive vascular dilatation in the deep layers of the skin just where the adipose tissue begins. This is regarded as a characteristic feature of the disease. The heart muscle shows no degenerative changes but the muscle fibres are separated by dilated capillaries. Similar capillary dilatation is present in the ciliary body of the eye, leading to excessive production of fluid in the anterior chamber. The tongue, oesophagus, stomach and small intestines reveal no abnormality, but in the large intestines enormous dilatation of blood vessels is encountered. SHANKS⁵⁵ finds telangiectatic capillary dilatation not only in the subcutaneous tissues but also beneath the pericardium and peritoneum, and in the lungs, endometrium and ovaries. In short, the dilatation appears to occur wherever the vessels are least supported. There is no surrounding inflammatory reaction and but little tendency to haemorrhage.

Clinically the disease begins with fever, vomiting, diarrhoea and oedema. The average duration of the condition is six weeks. Peripheral neuritis, except in one outbreak in Calcutta, is notably absent. In those cases showing absence of knee jerks the phenomenon is entirely due to the mechanical effect of the oedema (there is no anaesthesia and no tenderness of the muscles). According to CHOPRA & BASU⁵⁶ the cardiac condition is as follows:—In early cases there is tachycardia with muffling or reduplication of the mitral first sound. Later, murmurs of relative incompetence are heard at the apex and these are due to dilatation of the left ventricle. The right side of the heart usually shows no enlargement and congestive cardiac failure is rather rarely encountered. Cyanosis and jugular pulsation are notably absent and electrocardiograms show only sinus arrhythmia. On the other hand, SHAHA⁵⁷ reports that cardiac failure of the congestive type is common.

On the skin roseolar and petechial eruptions are frequently met with, and in addition Shaha describes another condition sometimes observed: "here and there, one finds red dots, varying from the size of a split pea to as big as a small grape, made up of blood vessels in the form of warts . . . they are sometimes sessile, but may be pedunculated; sometimes they bleed. They occur mostly on the lower limbs, but may occur on the trunk, both front and back, and rarely on the abdomen." SAGAYAM⁵⁸ in Fiji described a similar condition, only in his cases the capillary naevi bled profusely. GUPTA⁵⁸ reporting upon the 4th and 5th Calcutta epidemics stated that haemorrhages occurred from almost every orifice. Glaucoma is a late symptom.

Treatment consists largely in giving a liberal protein diet and substituting wheat bread for rice. Tincture of ephedra was found to be a valuable remedy by CHOPRA & BASU⁵⁶, and thyroid extract may be helpful. Opinion as to the value of the usual cardiac tonics appears to be divided. For the rest, treatment is symptomatic.

In conclusion, it may be stated that epidemic dropsy with its fever, gastro-intestinal symptoms, rash, telangiectases and glaucoma and in its freedom from neuritis, sudden cardiac failure and the absence of an infantile form is a clearly defined clinical entity, little resembling beriberi.

A Douglas Bigland.

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PLAGUE

MCMULLEN. Etudes sur la peste à Hawaï. [**Plague in Hawaii.**]—*Bull. Office Internat. d'Hyg. Publique* 1933. Nov. Vol. 25. No. 11 pp. 1931-1932.

The common flea of Hawaii is *Xenopsylla cheopis*. A new species of flea, *X. awauiensis*, has been found and may be a factor in the transmission of plague. Plague has been endemic for 25 years on the north-east coast of the island of Hawaii, which is the largest island of the group and there have been about 135 human cases during this period of time.

A second focus of plague was recognized in 1931 in the island of Maui.

W F Harvey.

PARDAL (Eduardo). La peste en Pampita (Prov. de San Luis). [**Plague in Pampita.**]—*Rev. Inst. Bacteriolog.* Buenos Aires. 1933 Nov. Vol. 6. No. 1. pp. 18-28. With 1 map. English summary (9 lines)

An account is given of the first appearance of plague in the province of San Luis, Argentina, in 1916 and its recurrence at long intervals up to the present time. A map, in which the dates of plague occurrence are attached to the towns, serves to illustrate the paper. The disease is shown to have followed the course of an important road starting from the capital, San Luis, and proceeding north to Pampita. In the present manifestation of plague as well as in the previous ones there has been an epizootic among rats coexistent with the human plague wherever it has happened.

W F H

WASSILIEFF (A.). Les rongeurs et puces de Tunisie et leur rôle dans la propagation de la peste. IV.—La réceptivité comparée des divers rongeurs tunisiens vis à vis de la peste. [**Rôle of Rodents and Fleas in the Propagation of Plague. Susceptibility of the Tunisian Rodents.**]—*Arch. Inst. Pasteur de Tunis* 1933 Nov. Vol. 22. No. 3. pp. 443-475. With 2 figs. [18 refs.]

An argument runs through the whole of this work regarding the preservation of the plague virus in fleas for long periods of time and the danger of establishing a flea plague reservoir in the interior of Tunis. The author discounts the importance of the commonly accepted sequence of rat, flea, man.

Plague may be introduced through the agency of man and not the rat. Such epidemics as have arisen in rural Tunis have been of human origin. Fortunately no permanent reservoir of plague exists at the present time. The danger exists, however, of its establishment and especially of its arrival from over the Tripolitan frontier. Most of the article is taken up with the points of the argument and with a forecast of what may happen in the future. Some interesting experiments are given which show that merion rodents (*Meriones shawi*) are unusually resistant to infection by plague bacilli, whether by cutaneous or sub-cutaneous inoculation. In this respect they differ completely from the guineapig, from rodents such as *Psammomys roudairei* and *Dipodillus dodsoni*, and from other rodents also. The most susceptible of the wild rodents of Tunisia are *Psammomys roudairei*, *Dipodillus campestris*, *Dipodillus dodsoni*, *Jaculus orientalis*, *Mus barbarus*; a little less susceptible are *Gerbillus hirtipes*, *Mus musculus azoricus* and *Mus musculus*.

gentilis Least sensitive is *Meriones shawi*. The rodent distribution of the country is regionally distinct. From the extreme north (Bizerta, Tunis) to Fom Tatahoune the rat population consists chiefly of *Meriones shawi* and to still further south of *Psammomys roudavrei*.

W. F. H.

VAN LOGHEM (J. J.) Naar aanleiding van vijf en twintig jaar Ratten-onderzoek [Twenty-five Years of Rat Research.]—*Geneesk Tijdschr v Nederl-Indie*. 1933 Dec 5 Vol. 73. No 25. pp 1581-1590 [Refs in footnotes]

General observations on the opinions held regarding the agency of rats in the propagation of plague form the subject matter of this article

The paragraphs under which the subject is treated are . (1) the sewer rat in the Netherland Indies, (2) morphological and biological differentiation of the field rat, (3) continuous and metastatic spread of plague, (4) active migration of rats, (5) exclusiveness of the rat family, and (6) nomenclature. It is interesting to learn how through a quarter of a century opinion gradually crystallized to that which is now held. At first, for example, it was thought that *Rattus norvegicus* did not occur at all in the Netherland Indies. This idea prevailed even up to 1911. Whether the sewer rat is gradually ousting the house rat receives consideration and it is thought that this has begun to take place in Java. The terms continuous and metastatic propagation of plague refer to transmission by contact and to a distance respectively, which, so far as plague rats are concerned, reduces to the distances at which house rats are met with from their human habitations. Under exceptional conditions such excursions have been noted but not as a general rule.

W. F. H.

EGOROV (A) The Rôle of Raptorial Birds in the Epidemiology of Plague.—*Rev. Microbiol., Epidémiol. et Parasit.* 1933 Vol 12 No 2 pp. 133-134 [In Russian English summary p. 134]

It is known that in raptorial birds—such as eagles, hawks, owls, etc.—the undigested parts of their prey are rejected through the mouth in the form of "casts". These contain the fur, bones, fragments of cartilage and tendons, and sometimes even tails and limbs, all rolled up into a bundle measuring 1-3½ inches in length and 1-1½ inches in breadth. The peripheral part of the "cast" usually contains the hair, while the centre is occupied by the other elements, the whole being soaked in the juice from the gizzard. If infected rodents are eaten by raptorial birds it is conceivable that they might disseminate plague through the medium of the "casts," provided *Past. pestis* retains its viability.

To test this the following experiments were conducted. A captive eagle, *Aquila hypalensis*, was fed on infected guineapigs and on normal rodents. The "casts" (regurgitated 2 days after the meal) were found to contain viable plague bacilli, as shown by growth in cultures and successful inoculation of rodents. Moreover, the bacilli which originated from the infected food-animal contaminated the "casts" derived from the normal animals fed to the eagle, the remains of which could be recognized by the colour of the fur. These preliminary experiments suggest the importance of studying the rôle of raptorial birds in the epidemiology of plague.

C. A. Hoare.

IMURA (Yasuzo) Observations et commentaires sur les mesures préventives contre la peste (résumé) [**Notes on Plague Prevention.**—*Bull. Office Internat. d'Hyg. Publique* 1933 Nov Vol 25. No 11 pp 1943-1951]

It was the task of the author to review the period from the time when plague first made its appearance in Japan in 1899 onwards to the present day. He makes his commentary on defensive measures against foreign rats, against fleas and on other preventive measures. Some of these carry the lesson of a comparatively useless expenditure of time and money for the results achieved and have a special interest for others on this account.

In the period under consideration 8 cases of plague were discovered in a port of quarantine. The result, again, of fumigation of ships was a destruction in 1926 and 1927 of 4.8 rats per ship in quarantine stations. Such a mediocre figure is scarcely commensurate with the discomfort imposed upon passengers. It is a little better in New York at 9.6 per ship. No one disputes the prime necessity of an active campaign against rats as an antiplague measure. And yet some of the measures taken are not economical. An organized corps of rat catchers generally obtains more indifferent results than if prizes are offered for the capture of rats. In the former case each rat caught cost 2 yen, which is too expensive.

A thorough cleansing of a plague proscribed house is one method of deratization. During the period 1914 to 1917 a total of 44,353 houses received such treatment in four large towns and this furnished 3,284 rats or only 0.6 per house. During that same period the method of offering prizes resulted in the taking of 992,653 rats at the moderate cost of 54,153 yen. Various measures have been directed against fleas. Cresol emulsion, carbon tetrachloride and naphthalene are flea poisons, but they have little penetrative power. Sulphuretted hydrogen is an excellent pulicide, and will kill fleas in 14 to 52 seconds in 1 per cent concentration. It has the disadvantage of attacking metallic substances. Finally the subject of preventive vaccination and the use of an immune serum receive a brief mention. W. F. H

GAUD (M.), JORGE (Ricardo). Sur l'importance du bubon sous-pectoral dans le diagnostic et l'évolution de la peste [**The Importance of the Subpectoral Bubo in the Diagnosis and Course of Plague.**—*Bull. Office Internat. d'Hyg. Publique*. 1933 Nov. Vol 25. No 11. pp 1924-1927 With 2 figs. on 1 plate, 1928-1930]

Both communications deal with the value of the exact position of the axillary bubo as being almost specific for plague and as accounting for secondary plague pneumonia.

The axillary lymph nodes are the crossing place for the lymphatics of the upper limb, shoulder, back and a large part of chest and abdomen. They are divisible anatomically into 5 groups, of which the specific plague group is essentially the thoracic. It is seldom that this group is affected by the lesser septic infections in the way that the brachial group is. There are the upper thoracic lymph nodes in front of the external mammary artery under the tendon of the pectoralis major at the level of the 2nd and 3rd inter-costal spaces and the lower thoracic nodes situated along the artery at the level of the 5th intercostal space beneath the body of the muscle. These same lymph nodes are

in communication with the intrathoracic lymphatics and this serves to explain the occurrence of plague pneumonias secondarily to simple bubonic plague. In seven cases of secondary plague pneumonia investigated in Morocco the axillary buboes were without exception restricted to the subpectoral lymph nodes

W F H

PARULKAR (R. D.) **Eight Cases of Plague treated with "Bayer 205."**—*Indian Med Gaz* 1933 Nov Vol 68. No 11 p 632

Only one of the eight cases recovered but "it should be stated that most of the patients had severe pneumonic complications"

W F H.

BORZENKOV (A.) & DONSKOV (G.). **The Experimental Infection of the Tick, *Hyalomma volgense*, P. Schulze and E. Schlottke, 1929, with Plague.**—*Rev Microbiol, Épidémiol et Parasit.* 1933 Vol 12. No 1 pp 25–30 [In Russian English summary p. 30]

On various occasions ticks (*Rhipicephalus schulzei* and *Ixodes autumnalis*) collected from marmots (suslik, *Citellus pygmaeus*, and tarabagan, *Arctomys bobac*) were found to harbour the plague bacillus. In order to establish the exact rôle of ticks in the propagation of plague the authors have undertaken a series of experiments with *Hyalomma volgense*, the cattle tick in the vicinity of Stalingrad (formerly Tsaritsin). The ticks were successfully infected by feeding on guinea-pigs, jerboas and marmots. They were capable of transmitting the infection to healthy rodents by the bite, while the inoculation of the faeces also produced infection. The results of the experiments were tested by the cultural method. Similar results were obtained with the larvae and nymphs of the tick. The plague bacilli were found to be viable in the intestine of the adult tick for at least 11 days, in the nymphs 3 days, and in the larvae 7 days

C A. Hoare

BABLET (J.) & GIRARD (G.). **Peste pulmonaire primitive expérimentale du cobaye [Primary Pneumonic Plague in the Guinea-pig, Experimentally Produced.]**—*C. R. Soc. Biol* 1933. Vol. 114. No 31. pp. 471–473.

An incision was made in the middle line of the neck and a suspension of plague bacilli introduced into the trachea. With this technique and the use of a series of animals the course of the infection could be followed—plague pneumonia, septicaemia, and involvement of the spleen and liver. Death supervened between the 70th and 75th hour.

W. F. H.

GREVAL (S. D. S.) & DALAL (N. P.). **On *Bacillus pestis*: New Techniques in Serology.**—*Indian J. Med Res.* 1933. Oct. Vol. 21. No. 2. pp. 283–294

It has always been found difficult to carry out an agglutination test with plague organisms owing to their liability to spontaneous sedimentation. The various methods hitherto described to overcome the difficulty have not been wholly satisfactory, and it is the object of the authors to describe a perfectly simple technique in detail, which has

been successful in their hands. They have also added absorption and complement fixation techniques for the recognition of *Past. pestis*.

The essence of the agglutination technique is the use of a stable suspension of the sediment from old broth cultures resuspended in normal salt solution. Normal salt agglutinated these suspensions in low dilution, but even this slight defect disappeared on the addition of a small quantity of formalin. Agglutination by the technique described is specific, in so far as the normal sera and the antisera available gave negative results, nor do such group organisms as *Past. avisepticus* and *bovisepiticus* give anything but a poor reaction. It is otherwise, however, with *Past. pseudotuberculosis rodentium* which gives a powerfully positive reaction, although perhaps not quite to the limits of *Past. pestis*.

The absorption tests and complement fixation tests have proved as successful as the agglutination tests and with the former of these identification of a fresh culture of a suspected plague bacillus from rats can be arrived at in 48 to 72 hours. Not all culture deposits, it has been found, form suitable suspensions for serological tests but the great majority do. The antigen in the complement fixation test is a filtrate from the broth cultures of *Past. pestis*.
W. F. H.

PONS (R). Influence des injections répétées de bactériophage spécifique dilué sur l'évolution de l'infection pesteuse expérimentale du cobaye. [Effect of Repeated Injections of Dilute Bacteriophage on the Development of Experimental Plague.]—*C. R. Soc. Biol.* 1933 Vol. 114. No 37. pp 1066-1068.

It has not yet been possible to check the course of plague in guinea-pigs by subcutaneous injection of bacteriophage. The author provides an explanation of this failure by suggesting a toxæmia as the cause of death, which has been produced by the solvent action of bacteriophage on plague bacilli. Thus the bacteriophage becomes a pathogenic, a toxic, and not a therapeutic factor, in conjunction with the causal agent of plague.

Guinea-pigs which are injected with a strong dose of bacteriophage, when plague septicaemia is at a maximum, die even more quickly than the controls. Repeated and early injections of dilute bacteriophage delay the development of the infection but never prevent it. What is very striking at the autopsy of the animal is the fatty degeneration of the liver. The liver is chamois-coloured, floats in water and is in a state of complete fatty transformation without any indication of necrosis or of septic foci and it is sterile. In the course of the repeated injections of bacteriophage the lytic principle sets free, after each injection, toxic bacterial substance which gives rise presumably to this fatty degeneration. An extension of the argument is made to an *in vivo* effect upon the bacteria. This would be similar to that *in vitro* effect, which is productive of two types of colony growth, one pathogenic and the other non-pathogenic, with a marked difference in colony appearance. If this also takes place *in vivo* as a result of injection of dilute bacteriophage, it seems reasonable to ask in the words of the author, "if we are not in presence of a general phenomenon of exaltation of virulence or toxicity, which would suffice to explain facts concerning the loss or recovery of pathogenic power by bacteria."

W. F. H.

LÉPINE (P) & BILFINGER (Fr.) Existence, dans le sérum de rats d'Athènes, d'un principe lytique pour le bacille pesteux [**Lytic Principle to the Plague Bacillus in the Serum of Rats of Athens.**].—*C. R Soc Biol.* 1934 Vol 115 No 2 pp 131-132.

The serum of 217 rats, which were a sample of 600 examined for plague, was in two cases lytic for *Past pestis*. No evidence was obtained of any enzootic rat plague being in existence at the time.

W. F. H.

HOLSENDORF (B. E.). Les abris à rats et leur rapport avec la propagation de la peste bubonique. [**Shelter for Rats in its Relation to the Transmission of Plague.**].—*Bull. Office Internat. d'Hyg. Publique* 1933 Nov. Vol 25 No 11. pp 1952-1955

The thesis maintained in this communication is that the provision of shelter in rat infested buildings is a more important factor in the continued propagation of plague than the type of place where they are captured. If the shelter for rats is not good the flea index is found to be too low for effective transmission of plague. Rat proofing of buildings therefore not only keeps rats out of them but also reduces the degree of infestation with fleas, the insect vectors of plague.

W F. H

BOYÉ Les résultats des vaccinations antipesteuses dans les colonies françaises (Sénégal et Madagascar, année 1932) [**Plague Vaccination in Senegal and Madagascar.**].—*Bull. Office Internat. d'Hyg. Publique.* 1933. Nov Vol 25 No. 11. pp 1933-1942. With 1 graph.

The results of plague vaccination which are set out in this memorandum are notable for the great frankness with which the author presents his negative instances.

His arguments begin in the usual way and we are led to expect the usual contrast in percentage results, always exceedingly adverse to the non-vaccinated individuals and practically always unaccompanied by any attempt to show that the two populations concerned are in any way comparable. He enters into a discussion of the relative value of lipovaccine and of the watery vaccine "P.S.T", the one of which had been used in one zone and the other in another zone. The lesson of vaccination results is then further driven home by reference to a particular instance of an accidentally unvaccinated hamlet with its 36 inhabitants, 14 cases of plague and 10 deaths. These cases were unique in the locality, for "all the vaccinated remained immune." One began to wonder why the author italicized his words—"a demonstration apparently convincing of the protective action of the vaccinations," and again:—"This island of non-vaccinated decimated by plague, surrounded by the vaccinated who remained untouched, appeared to afford an involuntary experiment demonstratively favourable to the vaccination." Then comes the disillusionment. "Unfortunately the observations made in the third zone show how dangerous it is to accept as proven conclusions which seem to be self-evident." The third zone had for a long time past been visited by plague every year. It was made a control zone, in which the general measures adopted in the other two zones against rat and flea were applied here also, but not a single

vaccination was carried out. The control zone, however, did not furnish a single case of plague. Other instances follow of a like nature. One fact, however, is indisputable, and is that the number of cases of plague in Senegal generally have steadily declined during the past six years.

The author describes some experiments at the end of his memorandum, which have been carried out in Madagascar, and which would show by animal experiment how much superior a vaccine containing living avirulent plague bacilli is to one in which the bacilli of a vaccine have been killed by heat or antiseptics.

W. F. H.

FLU (P. C.) Immuniseering van ratten tegen pest door middel van geconcentreerde bacteriophagaglysatens van virulente pestbacteriën.—*Nederl. Tijdschr. v. Hyg., Microbiol. en Serol.* 1933 Vol. 8 No. 3 pp. 245-264. [14 refs.]

CHOLERA.

KLEINE (F. K.). Die Entdeckung des Cholerabazillus vor 50 Jahren
 [The Fiftieth Anniversary of the Discovery of the Cholera Vibrio.]—
Deut Med Woch 1934 Feb 9. Vol. 60 No 6. pp. 222–
 223.

Anniversaries serve to remind us of the progress of science, in this case of the comparatively new science of bacteriology. The discovery of the cholera vibrio, fifty years ago, in December 1883 represented a momentous addition to the very few pathogenic organisms known at that early period. Almost equally important was the use from that time onwards of the method of pure culture on solid media which was destined to “unveil the causes of many fatal infections.” The credit of this discovery and of the introduction of these methods can without any dispute be accorded to Robert KOCH. A German commission, with KOCH as leader, landed in Egypt on 24th August 1883. Cholera had broken out there and Europe was afraid of an epidemic incursion. Some of the early views on the genesis of cholera are interesting to look back upon—its spontaneous origin, its origin from the putrefying bodies of dead rinderpest oxen which had been consigned to the Nile, the monsoon wind and the rise and fall of the subsoil water. What seems to have attracted KOCH’s attention first was the presence of a definite type of bacillus in microscopic sections of lesions of the intestine in cholera cases. A subsidence of the epidemic in Egypt brought the German enquiry to an end, but the indefatigable KOCH obtained permission to go on to British India to pursue his investigations of this bacillus. Every facility was accorded to him at the Medical College Hospital, Calcutta, and there he found the same bacillus in the intestinal tract of cholera cases. He showed likewise that it was absent from the tract in other diseases, that animals did not suffer from cholera during an epidemic and that animals could not be infected with his new-found bacillus. On the 2nd February 1884 KOCH announced to the German Government the fact that his bacillus was the true cause of cholera. Those who wish to read how much opposition was still given to his views may find them set out in the transactions of the Berlin cholera conference.

W F Harvey.

HURI (Maurice). Sur un vibrion isolé à Damas (Syrie) dans des cas de diarrhée d’été chez l’homme, *Vibrio enteritidis* (n. sp.). [*Vibrio enteritidis* a New Species from Cases of Summer Diarrhoea in Damascus.]—*Ann. Inst Pasteur*. 1933. Nov. Vol. 51 No. 5. pp. 640–649.

In this research the author gives reasons for regarding the vibrio so constantly isolated by him in a chronic low form of summer diarrhoea, with green slightly gelatinous motions, as the causal agent of the condition.

This vibrio could always be isolated in every successive attack succeeding the original acute attack. It possessed a rapid zig-zag motility; had only one flagellum, occasionally, however, one at either end; produced a slight pellicle; was strictly aerobic; had no proteolytic character and was not agglutinated by anti-cholera serum. Its pathogenic action on animals was variable, it being pathogenic to *Macacus cynomolgus* and the mouse, quite non-pathogenic to the

guineapig Both intraperitoneal and subcutaneous injections in the monkey were productive of the disease and the vibrio could be obtained from the stools

W. F. H.

KUBO (HISAO) & KU-LIEN-YUAN. **Pathological Anatomy of Cholera Asiatica.**—*Jl. Oriental Med* 1933. Nov Vol 19. No. 5 [In Japanese. English summary pp 68-69]

In their autopsy of three cases of true cholera the authors found that in all three the common bile duct was patent and that there was no hindrance to the entry of bile into the intestine. The rice water character of cholera stools is, therefore, not due to absence of bile. It seems to them probable that it is the great increase in volume of the intestinal contents which accounts for their colour. The quantity of bile secreted is "not sufficient to tinge the contents with its own colour."

W F H.

PARRINO (G.). *Influenza del pH del terreno di coltura su alcune proprietà biologiche del V. del colera.* [**Influence of the pH of the Medium on the Cholera Vibrio.**]—*Ann. d'Igiene* 1933 Aug. Vol. 43. No 8 pp 558-564. [10 refs.]

A study has been made in 10 strains of cholera and 3 strains of cholera-like vibrios of the alteration of biological characters in media of pH 5.9, 7 and 8.5. Those cultivated repeatedly at 8.5 showed increase of haemolytic power, more intense nitroso-indole reaction and some strains also greater agglutinability. At 5.9 these characteristics were reversed but in no case was there any modification of virulence, power of liquefaction of gelatin, or of type of colony. One strain, however, independently of the reaction, showed dissociation into smooth and rough colonies.

W. F. H.

i. SCHOLTENS (R. Th.) *Analyse des récepteurs du vibron cholérique.* [**Cholera Vibrio Receptors.**]—*C. R. Soc. Biol* 1933. Vol. 114. No 31. pp 420-422.

ii. —. *Sur la sommation des actions des deux agglutinines du vibron cholérique dans les hautes dilutions* [**Summation of the Actions of the Two Agglutinins of the Cholera Vibrio in High Dilutions.**]—*Ibid.* pp. 422-424.

i. Serums prepared by the author were shown, by means of absorption experiments, to contain either one or two agglutinins for the various cholera vibrio and El Tor strains used by him. These strains can be divided into two categories according to their antigenic characters, (1) those with two types of receptor, capable of producing two kinds of agglutinin and (2) those with only one kind of receptor. One strain of cholera vibrio, although it did not furnish two types of agglutinin, was still able to absorb them both and was agglutinated by both. This fact suggests that the phenomenon may really be a somewhat complicated one.

ii. In the second paper various hypotheses are considered to account for the fact that absorption of one agglutinin from a two-agglutinin serum results not only in disappearance of agglutinating power for the vibrios with one agglutinin receptor but also in a definite diminution in agglutinating power for vibrios with two agglutinin receptors. The

hypothesis favoured is one of a combined action of the two agglutinins exercised at low dilutions and too feeble to give flocculation when one or other is separately present
W. F. H.

LINTON (Richard W.) & SHRIVASTAVA (D. L.). **Studies on the Antigenic Structure of *Vibrio cholerae*. Part III. Further Analyses of Specific Carbohydrates.**—*Indian Jl. Med. Res.* 1933 Oct. Vol. 21. No. 2 pp. 379–384.

—, — & MITRA (B. N.) **Part IV. A Preliminary Examination of Carbohydrates in the Rice-Water Stools of Cholera Patients.**—*Ibid.* pp. 385–388.

Chemical studies of antigenic structure attack the problem of bacterial specificity in what must be its ultimate significance. The first of these studies tells of a modification of the deduction previously made, perhaps not unexpected, that the chemical difference between cholera and water vibrios, represented by possession of galactose- and arabinose-containing carbohydrate, is not as absolute as was thought. It is the object of this study to show that the distinction cannot be made, as the authors have found two strains of clinically cholera vibrios which possess the arabinose-containing carbohydrate. By this finding the water vibrio is again approximated to the cholera vibrio, instead of being sharply divided from it. A full description of the technique is given.

In the second communication the chemical analysis is transferred from the vibrios themselves to the faeces of patients suffering from the disease, and it has been possible to show that the rice water stools of eleven cases of cholera furnish polysaccharides. "Upon hydrolysis these polysaccharides yield reducing sugars which have been tentatively identified as galactose and arabinose" . . . "These are the characteristic sugars of the specific carbohydrates of the vibrios, when grown *in vitro*."
W. F. H.

LINTON (Richard W.) & SHRIVASTAVA (D. L.) **Further Studies on the Specific Carbohydrates of *Vibrio cholerae* and Related Organisms.**—*Proc. Soc. Experim. Biol. & Med.* 1933. Dec. Vol. 31. No. 3. pp. 406–409.

The authors find in this continuation research that a clear cut difference between cholera and cholera-like vibrios is not furnished by their specific carbohydrate content. Twenty-six agglutinable vibrios from clinical cholera contained galactose and eight arabinose. Four non-agglutinable water vibrios showed on analysis arabinose-containing polysaccharide. "Polysaccharides containing both arabinose and galactose have been isolated from 'rice-water' stools of cholera cases"
W. F. H.

SULMANN (Felix). Variationen bei Bakterien. II. Experimentelle Virulenzsteigerung von Choleravibrien durch Selektion ueberlebender Stämme. [**Increase of Virulence of Cholera Vibrio by Selection of Surviving Strains.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1933. Dec. 15. Vol. 81. No. 1/2. pp. 32–46. [14 refs.]

Those cholera vibrios surviving in old cultures after exposure to ultra-violet rays, and after subjection to heat, were examined in regard to the changes resulting in colony form and virulence. The research, it is explained, was parallel to and had its origin in the investigation made

after the B.C.G. catastrophe into the development of a virulent S-variant out of an avirulent R-strain. It was found that the virulence and colony form of El Tor vibrios after 6 months in old agar culture did not differ from those which had been daily subcultured up to that time. No difference, likewise, could be detected as a result of ultra-violet radiation. More success was obtained with heat, for in 4, or it may be 6, cases out of 24 it was possible to isolate strains, after exposure for 8-28 minutes at 48°C., whose virulence was increased. The author ascribes this increase to a selection of especially toxic variants. A similar investigation into the variation possibilities of *prodigiosus* pigment showed that an addition of saccharose, maltose or lactose to the nutrient agar transformed a previously stable white form into the red form. W. F. H.

SHILLONG **King Edward VII Memorial Pasteur Institute and Medical Research Institute. The Sixteenth Annual Report for the Year ending 31st December 1932** [MORISON (J.), Director]—31 pp. 1933. Assam Govt. Press [1s. 8d., Re. 1-2.]

A great part of this report is taken up with tables relating to rabies statistics, which are of the regulation type. We look especially, however, in perusing the report for information relative to research on bacteriophage in the laboratory and in the field. Nine cholera phage types named A to J have now been isolated, "each producing its own characteristic phage resistant strain of cholera." The field experiment on the preventive value of distributed cholera phage continued throughout the villages of Nowgong and a total of 27 deaths from cholera was recorded in 1932. Thus the cholera deaths for the three years of experiment amount to 124, which is the lowest for any three consecutive years since 1906. Habiganj, the control area to Nowgong in this experiment, has now adopted phage distribution and so ceases to be a control. Even better controls to Nowgong, however, are certain neighbouring districts. It has been possible to compare the incidence of cholera in Darrang with that of Nowgong by means of a changing correlation coefficient, a change which is expressed as being from a positive high coefficient of +0.6 for 1906 to 1929 to a negative coefficient of -0.1 after 1929. "Something has happened in Nowgong, a district of 560,000 people, which has not happened before, has not happened in the control districts and is not correlated with the diminution of cholera in the province. The only cause that we know of is the distribution of the bacteriophage to the villages." W. F. H.

BIEN (Charles W.) & TUNG (Chen-Lang). Electrocardiographic Changes in Cholera.—*Chinese Med. J.* 1933. July. Vol. 47. No. 7. pp. 662-665.

CHINESE MEDICAL JOURNAL. 1933. Aug. Vol. 47. No. 8. pp. 816-817.—Laboratory Methods Standard Bacteriological Diagnosis of Cholera. Recommended by the Central Cholera Bureau, Shanghai.

KIRIBAYASHI (Shigeru) & AIDA (T.) A Study of the Fate of Cholera Vibrio in the Sea Water of Keelung Port, Formosa.—*J. Public Health Assoc. of Japan.* 1933. Nov. Vol. 9. No. 11. pp. 1-9.

MANAKO (K.) Cholera and Cholera-like Vibrio. Part I. Types and Biological Characters of Cholera Vibrios prevailing in Manchuria during the Summer of 1932.—*J. Oriental Med.* 1933. Nov. Vol. 19. No. 5 [In Japanese. English summary p. 64.]

TROPICAL DERMATOLOGY.

CATANEI (A.) Etudes sur les teignes [A Study of Ringworm.]—*Arch. Inst. Pasteur d'Algérie* 1933. Sept. Vol. 11 No 3. pp 267-399 With 8 diagrams, 5 figs & 13 plates. [19 refs]

This long paper really constitutes a monograph on "Ringworm in Algeria"

The first chapter is devoted to epidemiology, the second to the clinical features of the disease, the third to the characteristics of the numerous fungi, and the last section contains details of experiments on animals, etc. Many excellent photographs help to make this the standard work on its subject, but its greatest value will be to those who are working in North Africa and to mycologists

M. Sydney Thomson.

ILDRIM (D.) Die Dermatomykosen Favus trichophytia und microsporia in Aserbaydshan (Transkaukasus) [Favus and Microsporon Infection in Azerbaijan (Transcaucasus).]—*Arch. f. Schiffs- u. Trop.-Hyg* 1933. Nov Vol 37 No 11. pp 505-508. With 3 figs.

An investigation into the local incidence of these diseases.

During 1926 a total of 7,584 cases of dermatomycosis were seen. Of these, 430 were carefully studied with the result that 323 were proved to be due to Achorion and 24 to Microsporon infections. Of the 83 Trichophyton infections, *T. gypsum granulorum* proved to be the most common with 16 examples. Among 265 patients, 60 per cent. were proved to have been infected through relatives and 89 per cent. were under the age of 15 years. Favus is locally known as "Ketschal" and patients are even called "Ketschal-Mamed," etc., by their friends, nicknames which often stick to their victims throughout life

M. S. T.

BURNIER & DUCHÉ (J.) [Un cas d'épidermomycose due à *Trichophyton rubidum*.] [A Case of Epidermomycosis due to *Trichophyton rubidum*.]—*Bull. Soc. Française Dermat. et Syph.* 1933 Vol. 4. pp. 379-380 [Summarized in *Rev. Applied Mycology* 1933. Sept. Vol. 12. Pt 9. p 569]

"Clinical details are given of an erythematous-squamous epidermomycosis of the thighs and legs in a female patient, who contracted the disorder during a stay in the Cameroons. The fungus isolated from the squamæ was characterized by a downy, white colony with a red edge and septate hyphae 3 to 4 μ in diameter, and therefore agrees with *Trichophyton rubidum* Priestley, hitherto reported only from Asia and Oceania. In an unpublished article OTA divides *T. rubrum* into four categories according to the mode of pigmentation, viz., red mycelium with or without diffused pigment, and white mycelium with or without diffused pigment. On this basis the fungus under observation would belong to the third of these groups. Morphologically, however, it presents the characters of an *Epidermophyton*, the spindles resembling those of *E. inguinale* [*E. floccosum*: loc. cit.], from which it differs, however, in the site of its occurrence on the body."

DE ALMEIDA (Florianópolis) As blastomycoses no Brasil. [**Blastomycosis in Brazil.**]—*Ann. Facul. de Med de São Paulo* 1933. Vol. 9 pp. 69–163. With 67 figs on 31 plates [128 refs.] English summary.

A detailed study of the different organisms that have been incriminated.

This excellent work is concluded by an English summary (p. 154) which is very adequate. The first chapter defines the subject and presents a classification of the fungi. Each of the remaining ten chapters deals with all the characteristics of a particular organism. Their titles may thus be summarized as: *Candida albicans*, *Candida butantanensis*, *Neogeotrichum pulmomoneum*, *Torulopsis dermatitidis*, *Protoomyces infestans*, *Coccidioides immitis*, *Pseudococcidioides mazzai*, *Paracoccidioides brasiliensis*, *Rhinosporidium seeberi*, *Trichosporium pedrosoi*. The work is very well illustrated and will prove of great value to those interested in this subject. M. S. T.

CARRIÓN (A. L.) & KOPPISCH (E.). Observations on Dermatomyecosis in Puerto Rico. Report on a Case of Chromoblastomycosis.—*Puerto Rico J. of Public Health & Trop. Med.* 1933. Dec. Vol. 9. No. 2. pp. 169–190. With 18 plates. [10 refs.] [Spanish version pp. 191–193.]

Describes the first case of Chromoblastomycosis to be recognized in Puerto Rico.

The patient, a male white labourer aged 50, first noticed a small, itchy papule on the dorsum of the left foot some fifteen years before. This lesion gradually spread excentrically and new efflorescences appeared. Each year has seen an extension until the whole of the leg up to the middle of the thigh became involved. The eruption was very polymorphic; dull red plaques of infiltration up to 3 in. in diameter, nodules from which a cheesy material could be expressed, prominent and irregular fungating areas and ulceration. The lower part of the leg was thickened and oedematous. Deep metastatic nodules were present in the right thigh and left forearm.

Each type of lesion was examined histologically and showed pseudo-tubercles surrounded by a varying degree of fibrosis. The organism was isolated from each of these tissues and also from the metastatic foci. Hanging-drop and plate cultures were made. The parasite belongs to the genus *Hormodendrum*, but the species has not been definitely established as yet. Of 22 animals (monkeys, rabbits and white rats) inoculated experimentally, only one white rat showed disease at autopsy.

Considerable improvement has occurred as a result of the daily administration of high doses of sodium iodide intravenously over a period of approximately two years.

The illustrations are all excellent.

M. S. T.

CATANEI (A.) & LEGROUX (Ch.). Un nouveau cas de mycétome observé en Algérie. [**A New Case of Mycetoma in Algeria.**]—*Arch. Inst. Pasteur d'Algérie*. 1931. June. Vol. 9. No. 2. pp. 378–381. With 2 plates. [14 refs.]

In describing shortly with radiographs an advanced case of Madura foot with yellow grains (*Nocardia madurae*) the authors give a chronological account of the observations on mycetoma in Algeria since the

first in 1892. These are 15. The causative fungi, which were isolated in 14, are —

<i>Nocardia maduræ</i> (H Vincent, 1894)	isolated	10	times
<i>Scedosporium apiospermum</i> (Saccardo, 1911)	„	2	„
<i>Madurella mycetomi</i> (Laveran, 1902)	„	1	„
<i>Glenospora claptieri</i> Catanei, 1927	..	1	„

A. G. B.

ELMES (B. G. T.). **A Case of Black Grain Mycetoma.**—*Trans. Roy. Soc. Trop. Med. & Hyg* 1934 Jan 31. Vol. 27. No. 4 pp 417–419. With 2 figs on 1 plate.

A record of the first case of Black Grain Mycetoma recognized in Nigeria

The tumour, measuring 4 in by 2½ in, was removed from the outer side of the knee of a native of Bornu Province, Northern Nigeria. It consisted of fibrous tissue riddled with sinuses and containing one or two larger abscess cavities filled with necrotic material. The lacunae contained a soft greyish-yellow rather greasy substance dotted with black grains. These grains were hard, brittle and irregular, measuring 0.5 to 1 mm in diameter. Details are given of the histological appearances, but not of the cultural features. The organism was identified by J. T. DUNCAN as *Madurella mycetomi* M. S. T

LOEWENTHAL (L. J. A) **A New Cutaneous Manifestation in the Syndrome of Vitamin A Deficiency.**—*Arch. Dermat. & Syph.* 1933. Nov. Vol 28. No 5. pp 700–708 With 2 figs. [Summary appears also in *Bulletin of Hygiene*]

A peculiar dermatosis was noted in the inmates of the Uganda Central Prisons and the majority of the 150 cases noted also suffered from night-blindness and xerophthalmia.

The clinical features of this condition are:—(1) dryness of the skin affecting the whole body except the face and scalp; (2) itching, which is a prominent feature; (3) a papular eruption, which is typical of the condition. The papules are about ¼ inch across, smooth-topped, black and shiny, the edges are sharply demarcated and their shape is round or polygonal. They are not as obtuse or coniform as the acne papule. They are found almost invariably on the extensor aspect of the arms and on the front and outer surfaces of the thighs. They may be present to a variable extent on the buttocks, loins, chest and back, (4) folliculitis without the presence of pus is sometimes present, the inflamed follicles may be an early stage of the papule, (5) acne, without pustulation, is common and is seen in the middle-aged as well as the young men. Histologically the papules are typical; the pilo-sebaceous follicle is completely sealed with a mass of horny tissue. The skin adjacent to the follicle is thickened until at its margin the stratum corneum is three times its previous thickness. The prickle cell layer shows marked acanthosis in the perifollicular region and the inter-papillary processes are much elongated, whilst in the basal layer there is distortion of the cells and a varying degree of polymorphonuclear infiltration. In the corium there are signs of perifolliculitis with invasion by lymphocytes and fibroblasts. There is no increase in the chromatophores but the pigment is increased per square unit of surface, producing the blackness of the papule. The condition clears up in

from 1 to 9 weeks after commencing treatment with cod liver oil, though it does not respond so quickly as the eye lesions. A deprivation of fat alone does not cause this skin eruption and the evidence is all in favour of vitamin A deficiency being the sole cause. *H N H Green*

BUIST (T P), BHATNAGAR (S S) & CARR (L H) **Pyosis Mansonii and Allied Infections of the Skin in India.**—*Jl. Roy Army Med Corps.* 1934. Jan. Vol. 62. No 1 pp. 47-50

A description of the clinical features and treatment of cases seen in India during 1929, 1931 and 1932.

The forty-six cases of pyosis were clinically typical. The usual intracellular and extracellular Gram-positive diplococci were found in smears. In none of the cases were any chain forms detected. On culture this diplococcal arrangement was never entirely lost, although the colonies proved otherwise indistinguishable from *Staphylococcus pyogenes aureus*. Anaerobic cultures were not attempted. A mixed strain vaccine of 150, 250 and 450 millions at four-day intervals proved very efficient. For local treatment resinol, 1 per cent mercurochrome and Ung. hydrarg. nit. dil were used. The same organisms were also found in conditions which were clinically typical of foot tetter, sycosis barbae, eczematoid dermatitis of the hands and purulent dermatitis of the feet. *M S T*

APARICIO (Manuel). Ueber Narbenbildung beim Mal del Pinto und ihren Charakter bei der Leiche. [The "Scarring" of Pinta and its Structure as determined from Post-mortem Specimens].—*Arch f Schiffs- u. Trop-Hyg.* 1933. June. Vol. 37. No. 6 pp 318-319. With 1 fig.

Material was obtained from the bodies of three patients who had died of different diseases. It is stated that the white appearance of the old patches was found to extend deeply into the subcutaneous tissues and even through muscle, right down to bone. The deeper the "scar" the wider did it become so that the total area is likened to a bottle. Pigment was present in some quantity and the deeper parts showed definite melanosis, e.g., the definite deposition of pigment in the muscle-fibres close to bone. It is suggested that these changes may be the result of salvarsan treatment, post-mortem effects or even that they form a part of the disease. *M S T.*

BECKER (S William). Vitiligo. A Clinical and Histologic Study, with a Consideration of Pinta.—*Arch. Dermat. & Syph.* 1933. Oct. Vol. 28 No. 4. pp. 497-507. With 5 figs. [13 refs.]

Two cases of vitiligo were subjected to ultra-violet radiation and pieces of skin were frequently excised for microscopical examination. In one patient a small amount of pigmentation followed treatment. This pigmentary activity was also proved by the formation of dendritic melanoblasts and by irregularity of the epidermodermal junction with local cellular infiltration. Cellules claires of Masson were found in the depigmented areas. Sections were also prepared from material obtained from cases of pinta at different stages of development. First there appears an inflammatory reaction with marked acanthosis which is immediately followed by a very intense chromatophore pigmentation.

This melanosis is then gradually absorbed until the patch is completely depigmented. Then there is an absolute disappearance of melanoblasts and Masson's cells, a disappearance which may explain the very great resistance to treatment found in the vitiligo-like patches of pinta.

M. S. T.

CASTELLANI (Aldo) Case of Tokelau (*Tinea imbricata*) of Fifteen Years' Standing in a European Reprinted from *Med Press & Circular* 1933. May 17. 4 pp With 2 figs.

CASTELLANI (Aldo). Blastomycosis · a Short General Account —Reprinted from *Med Press & Circular* 1933 May 31 16 pp With 9 figs

KANAGARAYER (K) A Case of Cutaneous Blastomycosis of the Ear —*Malayan Med J* 1933 Sept Vol. 8. No 3 pp 203-205 With 2 plates

NIÑO (Flavio L) Nueva observación de tricopatía piédrica por "Piedraia Hortai" en la República Argentina —*Prensa Méd Argentina* 1933 July 26 & Aug 2 Vol 20 Nos 30 & 31 pp 1661-1671 ; 1699-1712 With 23 figs [28 refs.]

MISCELLANEOUS

1. HEALTH Canberra. 1933 Sept. Vol 11 No 9 pp. 73-88
Commonwealth Activity in the Field of Tropical Hygiene.
11. CILENTO (R. W) **Australia's Problems in the Tropics.**—Reprinted from *Rep. of Australian & New Zealand Assoc for Advancement of Science* Vol. 21. pp. 216-233.

These two papers deal respectively with Commonwealth activity in the field of tropical medicine as regards institutions and state action and with the problems that Australia has to solve, or is in process of solving, in her tropical parts. They are historical surveys which supplement one another

i. The first responsibility for tropical medicine assumed by the Commonwealth Government was the Papua Act, 1906, whereby it became responsible for that tropical territory; by the Quarantine Act, 1908, the Commonwealth undertook the control of quarantinable diseases, and in 1910 the Institute of Tropical Medicine was opened at Townsville, Queensland. From 1913 the Institute carried out a survey of tropical diseases existent in North Queensland, including the incidence of human and animal parasites, followed by a survey of the Torres Straits Islands and the Northern Territory. Whereas in the Islands several tropical diseases were noted, in the Territory there was little but yaws and ulcerative granuloma, and hardly any malaria. The physiological changes of a white population living under the conditions prevailing in the coastal districts of tropical Australia were next studied—with an interruption caused by the War. In 1920 the Australasian Medical Congress to which the results of all these activities were submitted passed a resolution in which *inter alia* the opinion was expressed that "the whole question of successful development and settlement of Tropical Australia by white races is fundamentally a question of applied public health in the modern sense." The Congress was "unable to find anything pointing to the existence of inherent or insuperable obstacles in the way of the permanent occupation of tropical Australia by a healthy, indigenous, white race." Moreover it considered that "the absence of semi-civilised coloured peoples in Northern Australia simplifies the problem very greatly." The Congress called for an improvement in the quarantine defence system, the establishment of diagnosis laboratories at four places in the N Territory and tropical Queensland, and the extension of the Hookworm Campaign to include the geographical distribution of malaria and filaria, indicating the measures needed for their eradication.

These suggestions have been acted upon. The Hookworm Campaign which had been carried on for 16 years and on which the Commonwealth has spent over £57,000 came to an end in 1933; the problem in Dr. CILENTO's phrase is "effectively and satisfactorily finalized." In 1921 on the occasion of Dr. HEISER's visiting Australia he was asked to advise on the future development of the Townsville Institute. He suggested that it should cease to be primarily a research institute and should become a central laboratory and administrative headquarters for dealing with the principal health problems of tropical Australia, Papua, and late German New Guinea. Meantime the mandated territories of Nauru and the "Territory of New Guinea" had been placed under the Commonwealth. In 1924 Dr. CILENTO was seconded for duty for one

year as Director of Public Health in the Mandated Territory, and in 1925 he recommended in evidence before a Royal Commission the establishment of an institution of university rank where degrees in hygiene, including tropical hygiene, could be bestowed, indicating Sydney as the most suitable place. A School of Public Health and Tropical Medicine was accordingly founded at Sydney in March 1930, to be managed jointly by the Commonwealth and the University of Sydney.

A synopsis is given of the work accomplished by the School ; it acts as a clearing house for information on every aspect of public health and tropical medicine, and is recognized by the Colonial Office as an approved training school for medical appointees to the Colonial Services. Native medical assistants from Papua are to be trained there in the summer of 1933-4.

ii Dr. Cilento, now the Chief Quarantine Officer (General) North-Eastern Division, with headquarters at Brisbane, delivered this Presidential Address before the Australian and New Zealand Association for the Advancement of Science (Section of Medical Science and National Health). The lecturer pointed out that the tropical portion of Australia and her dependencies together make up the largest tropical possession within the British Empire, the tropical part of Australia alone forming an area 20 per cent. larger than British India and its administered territories, and five times as large as Kenya Colony and Protectorate, moreover it contains " the largest collection of a population purely white within the tropics of the world." With the exception of a small area in Central Australia, no part has a rainfall below 10 inches, and most receives 20-30 inches. The total area of the tropics in and administered by Australia is 1,332,320 square miles.

In the settlement of tropical Australia three distinct periods are recognized—(1) that of strategic dispersal (2) that of economic extension with coloured labour and (3) the post-federation period.

(1) In this period the only attempts at settlement in tropical Australia were tiny out-posts in the far north ; here the chief ailment was scurvy, there is one record of malaria but it was apparently non-indigenous. In this period there is no evidence of the existence of any form of tropical disease in northern Australia.

(2) The introduction of coloured labour began in 1863 when 67 kanakas were brought to Brisbane. Chinese were also introduced to work the mines in Queensland. The kanaka traffic went on till 1890, though by 1877 attention has been called to the appalling mortality, which a medical board reporting in 1880 attributed to " poor feeding, bad water, over-work and the absence of proper care when sick." Up to 1890 46,387 Islanders had been introduced. Throughout the period of coloured labour the crude death rates for white men were enormously in excess of those of other States so that anyone in search of arguments against the suitability of the country for settlement would not have been at a loss ; it was, however, evidence not of the unsuitability of the country but of the results that follow the introduction of a diseaseridden class of coloured indentured labour. The exclusion of coloured labour in 1901 saved Australia from the " poor white." In the Northern Territory in this period there were several outbreaks of malaria which became endemic over a large area of country. Leprosy was not endemic among the aborigines ; it is clear that it was introduced in the immigration subsequent to the foundation of the British Colony.

(3) Federation, 1900-1, had a marked effect upon tropical medicine in Australia. Study at the Townsville Institute showed what the endemic diseases of tropical Australia were and these are considered in turn.

Malaria is confined at present to a small area in north-west Australia, and two areas in N Queensland, and almost entirely to cattlemen, miners and sugar-cane labourers; in the Northern Territory it is found on the two watersheds where settlement is very sparse. The distribution of anophelines is heavy but extension of malaria among the white population has only occurred "where conditions have been primitive, where hardships are constant, and where sanitation is poor and work heavy." In the present decade malaria accounts for death in 5 out of a million but the situation might be altered by any unexpected concentration of people or slackening of hygienic control.

Filaria appears in the records in 1883, chiefly at Brisbane; at one time 15 per cent of patients in the surgical wards of the hospital were infected. To the north the whole of the eastern coast was affected but not inland towns. Elephantiasis is relatively uncommon but is common enough in the tropical dependencies. One may reasonably suppose that the filaria was introduced with the kanakas. It is uncertain, however, whether *Filaria malayi* is not present as well as *F bancrofti*.

Hookworm disease was first reported in Queensland in 1889 but attracted little attention till 1916. The Hookworm Campaign, in which American aid was given, mapped Australia and its dependencies and instituted control measures.

"The disease has been localised in six endemic coastal areas, and resident nurses and sanitary inspectors appointed for its control. A list of locally resident infected persons, compiled from year to year by the intensive operations of the former ambulatory hookworm units, is placed in the hands of each resident nurse on her appointment to an endemic zone. It is then her duty to follow up each case to an absolute cure, and subsequently to keep the patient under observation to detect re-infection, if any. For the purpose, the nurses are specially trained in the microscopical diagnosis and the detail of treatment of the disease, to the point of absolute proficiency. To assist with the equally important feature of the work—the control of soil pollution and rural sanitation—sanitary inspectors, either those specially appointed to the hookworm unit, or locally-resident officers engaged in general health work, are charged with the correction of defects in every privy in the infected area, and particularly those in relation to actual cases of the disease."

Routine field work is now the province of each State. Though for white persons the hookworm is definitely under control, this is not so with the aboriginals. In any case the situation must be watched with great care for a decade at least. It is pointed out that the hookworm of Melanesia is *Necator americanus* and that of Asiatic immigrants *A duodenale*; that the latter is very much harder to expel and in Australian experience does not react to carbon tetrachloride.

Leprosy New cases are still being reported from Rockhampton and its hinterland and for the whole coast north and west to Alligator Creek in the Northern Territory.

Other diseases in Queensland and the Northern Territory—undifferentiated fevers, ophthalmia, yaws, granuloma, trachoma, typhoid—have not received careful study.

In the author's Conclusions occurs this significant passage :—

"After the first flight of Sir Ross and Sir Keith Smith from England to Australia, it had been increasingly recognized that, geographically, tropical Australia was our front door, and the natural highway between Australia, civilization, and markets"

A G B

BARRETT (James W) **The Health of the People of Papua.** [Correspondence]—*Med Jl Australia* 1933. Dec. 16 20th Year. Vol 2 No 25 pp 835-836

It appears from this letter that the Commonwealth of Australia has sent a number of Papuans to the University of Sydney for six months' instruction in the elements of medical science. The author suggests that training at the excellent native medical school at Suva, Fiji, would be far preferable. After the four years' course, the Papuans would return to their country, really well-trained and unspoilt by European contact. He agrees that it is impossible as well as unwise to attempt to staff Papua with European doctors

A. G. B.

CUNNINGHAM (E. R.), KILBORN (Leslie G.), MAXWELL (James L.), MORSE (W. R.), MULLETT (Harrison J.) & DICKINSON (F.). **The Nosu Tribes of West Szechwan. Notes on the Country and its Peoples and on the Diseases of the Region. With a Foreword by Dr MAXWELL**—*Chinese Med. Jl.* 1933. Mar. Supplement 56 pp. With 16 figs on 8 plates & 1 folding chart. [16 refs]

This brochure from the Henry Lester Institute, Shanghai, deals with a tribe or tribes inhabiting the southern bend of the Yangtse River in the south-western corner of the province of Szechwan, an area which is politically Chinese, but geographically forms part of the foot-hills of Tibet. Several investigators took part in the survey.

The Nosu have little in common with the Chinese and Chinese and Nosu have a mutual contempt for one another. The district is largely mountainous. Dr James L. Maxwell made a preliminary survey of the general diseases met with and it is with this that we are here concerned. No case of *cholera* was met with, the last serious epidemic occurred in 1910. The common *epidemic diseases* of children are strikingly absent. It is suggested that the small size of the villages and the wide separation of the houses together with the absence of easy communication account for such diseases failing to spread. *Smallpox* was obviously rare; the Nosu contrasted strongly with the pock marked Chinese of the same region, and it is noted that the Nosu are strong believers in vaccination, which is arm to arm. A disease called *Han-tin* which is considered very fatal is believed to include typhus and relapsing fever, typhus being the chief cause of the fatality. The absence among the Nosu of *tuberculosis* in all its forms is remarked as striking, and here again the Chinese are contrasted. Only one case was noted, pulmonary tuberculosis in a Nosu who had settled in one of the cities of the valley. There was no disease of bones or joints, no evidence of tuberculous glands, old or recent. There is no immunity, in schools where Nosu boys are admitted they are found very liable to pulmonary tubercle. The cause of the freedom must lie in the outdoor life in the mountains, and it is noted that the altitude ranges from

5,000–10,000 feet. *Leprosy* is very common and is probably the most important serious disease of the region. It is looked on with abhorrence, the sufferers are driven away and are even burned or buried alive. In consequence of this Dr Maxwell saw only two cases among the mountain Nosu, one of which had failed of recognition by the tribesmen owing to "lack of involvement of the eyebrows with loss of hair." Lower down the valley several cases were seen among both Nosu and Chinese. *Syphilis* is widespread. *Malaria* exists in the lower valley but no case of splenic enlargement was noted in a "very large number" of children. *Ascariasis* was the most common affection of children. *Infantile diarrhoea* is common and very fatal, milk is not used. *Scabies* among the Chinese recalled the Chinese proverb, "Of ten men eleven have itch," but the Nosu rarely suffered: the author is unable to suggest an explanation. *Opium smoking* is more common among the Chinese here than in any part of China known to Maxwell, 80 per cent. of adults are heavy smokers, the Nosu, however, are not greatly affected. *Acute rheumatism* and the *vitamin deficiency diseases* seem to be absent.

Of 130 persons examined by Dr Cunningham, the ophthalmologist, 30 had *trachoma*. Dr. Mullett, dentist, reported caries of the teeth as practically absent among 140 adults. A G B

MARQUE Les maladies transmissibles observées dans les colonies françaises et territoires sous mandat pendant l'année 1931. [Transmissible Diseases seen in the French Colonies and Mandated Territories in 1931.]—*Ann de Méd. et de Pharm Colon.* 1933. Apr.–May–June Vol. 31 No. 2 pp 123–322

This long report, dealing as it does, with all the French colonies—in Africa, Asia, S. America and the Pacific—is in many parts little more than a catalogue.

The chronicle begins with *maladies pestilentielles*—yellow fever, cholera, plague and smallpox, then takes up the *maladies endémo-épidémiques*—malaria, trypanosomiasis, dysentery, beriberi [which seems rather out of place in this company]; *maladies transmissibles communes à la métropole et aux colonies* and finally *maladies sociales*—tuberculosis, venereal diseases, leprosy. A few notes gathered from the report follow.

At Dakar of bubonic *plague* there were 300 cases, of septicaemic 173 and of pulmonary 42. The proportion of septicaemic plague has passed from 6 per cent. in 1929 to 50 per cent. in 1931. The septicaemic form is seen in the poorest of the population and it is considered that the preponderance in them is due to lack of resistance. Rats are dealt with by traps and sulphur fumigation of their runs; no less than 508,815 were caught. Of the fleas found on rats 80 per cent. are *X. cheopis*. Flea-traps, consisting of plates filled with oil in which floats a burning wick, have given good results, e.g., 180 traps in one village accounted in one night for 2,554 fleas and in another for 2,166, but the author acknowledges that plague prophylaxis is difficult to effect by flea destruction. Plague vaccination, carried out on more than half the population, has not had striking results and is accepted with a "certain lassitude" by the people. In Madagascar inter-human infection is considered to play an important part in the bubonic as well as the pneumonic form.

In Indo-China *cholera* has been regressing since 1927, attributed by some to the campaign of vaccination carried out for three consecutive years

Yellow fever in West Africa was represented by 40 cases, 10 of which were from the Ivory Coast, 11 from Upper Volta, 11 from the Sudan. The sporadicity of the cases was the chief characteristic. Many of them showed no obvious interdependence, but the contacts of non-Africans with the natives were very close, instances are given.

Malaria is more fatal in Indo-China than in the French colonies in Africa. In the year under review it caused more deaths in Indo-China than did cholera, 1,697 against 1,643, more than half the cases in which the species of parasite was ascertained were subtertian. However, blackwater fever is much less common in Indo-China than in Africa.

Of *trypanosomiasis* the author writes that the disease is now mastered and that unless efforts are relaxed the future may be faced with confidence. Of 12 cases treated at Dakar it is said that the majority came from British Gambia. The disease is very prevalent in Upper Volta to the north-west of the Northern Territory of the Gold Coast. In the Koudougou district 5,796 new cases of infection were discovered, of whom 3,840 were "completely treated" and in the Gaoua district the corresponding figures are 1,689 and 736. In Togo trypanosomiasis exists only in the north-east, here of 60,263 examined in this year 1,507 were found infected, 2.21 per cent., and 64,166 injections were given including 30,304 of tryparsamide. A number of natives, for economic reasons, were moved from the Binah valley, with the result that the disease is disappearing from among them though it is not stated that tsetse are absent from the new area.

In Cameroon in 562,583 examined, 1,937 fresh infections were found, 0.34 per cent.; of old trypanosome infections there were 75,753. From the results of this and previous years it is believed that there are some 116,000 sleeping sickness patients alive, almost all in apparent good health. As the mortality gets less the birth-rate goes up, e.g., in Akonolinga in 1922-3 there were 48,000 inhabitants, 4,900 deaths from sleeping sickness and 1,421 births: recent enquiry shows 59,000 inhabitants—2,025 deaths from sleeping sickness and 2,137 births. In French Equatorial Africa no less than 1,317,604 natives were examined, among those there were 14,307 fresh infections, nearly 10,000 of them at the first stage; 38,249 old patients were seen. The new infections are more numerous than in the two preceding years but this is attributed to the more complete investigation. Of 16,855 patients treated in hospital 674 died, 3.9 per cent. A table gives details for each of 28 sectors. The "index of fresh infection" is given as 1.08 per cent.

Under *Bilharziasis* an increase of the intestinal form is noted in Guadeloupe. At Basse-Terre 150 of 223 boys were infected and at a girls' school 93 out of 159; in 1914 LEGER had found an index of 10. A fresh water supply is being procured in place of a river in which Planorbis are numerous. The same prevalence of intestinal schistosomiasis and absence of the vesical form is noted at Martinique.

Under *Filariasis* the author comments on the scantiness of the information received. Of guinea worm infestation in this year 10,023 cases were reported, 4,800 from Upper Volta. It is sought to prevent this infestation by the digging of wells in the villages.

Beriberi occurred chiefly in Indo-China, there were 6,320 cases, 5,322 of which were credited to Cochin-China and 546 deaths. [The

table in which these deaths are allocated to five constituent colonies gives them incorrectly, the figure 158 for Tonking should, according to the text, be 16]. The prevalence of the disease has been increasing for some years. In Cochinchina beriberi occurs in the rice-growing districts and is due to the abuse of white mechanically-polished rice.

Yaws is very common throughout French West Africa except in the Niger Colony and Senegal where it is very rare, and the Sudan where it is fairly common. In Upper Volta 7,060 cases were reported against 2,548 in 1930, two reasons given for the increase are the popularity of stovarsol treatment and the occurrence of many cases twice or more in the records. The same is true for the Ivory Coast, where the consumption of stovarsol has risen in 6 years from 25 to 170 kgm. In Guinea yaws is more frequent in the coastal than in the Sudanese regions. In French Equatorial Africa it is met with everywhere.

Trachoma is very rare or non-existent in the coastal and forest regions but frequent in the Sudanese regions. At Dakar and in Senegal it is fairly often seen. In Mauretania, Sudan, Upper Volta, Niger, there is no reliable information. In the Ivory Coast it is absent. Will this immunity persist, the author asks, when this colony is linked by railway with the trachomatous areas to the north? In Togo trachoma is thought to be less rare than in the above-named areas, but not to be a factor in the blindness which is so common, no less than 14 per 1,000 are blind in one eye. In Indo-China trachoma is a veritable social plague.

There are several pages on *venereal diseases*. This excerpt must suffice—Lymphogranuloma inguinale, formerly climatic bubo, is very common on the Ivory Coast. It develops generally in three weeks, behaving like an infective disease.

A. G. B.

VAN CAMPENHOUT. L'assistance médicale aux indigènes du Congo Belge [Medical Assistance to Natives of Belgian Congo].—*Bull. Office Internat d'Hyg Publique*. 1933 Oct Vol 25 No. 10 pp 1789-1792

In October 1930 a fund called *Foreami* (Fonds Reine Elisabeth pour l'Assistance Médicale aux Indigènes Congo Belge) was instituted for the purpose of combating tropical disease in Belgian Congo. It amounted to 150 million francs and is said to yield an income of 9 million francs. The sector chosen for its work was one in the lower Congo. A report on the first year's activities has recently appeared (see this *Bulletin*, Vol. 30, p. 569).

In connexion with the fund there is a Council and Committee in Belgium with a bureau at Brussels. A Committee in the Congo is presided over by the Governor General. The program includes medical assistance to the natives in its widest acceptance. The medical personnel consists of 10 doctors and 10 white sanitary agents. The rates of pay and pensions are governmental; the agents of *Foreami* can pass to Government service and back again. *Foreami* also has at its disposal the personnel of the Service auxiliaire d'Assistance Médicale Indigène, so that there are in all 15 doctors and 39 white sanitary agents. For 1932 this provision was increased and *Foreami* has been able to subsidize the measures against sleeping sickness in Ruanda-Urundi and laboratory work on leprosy in Nepoko. In 1933 it was to extend its area of action to the province of Congo-Kasai. When these sectors have been sufficiently sanitized it is intended to transfer the organization to other sectors.

A. G. B.

KHALIL (M) Report on the Mission of the Research Institute, Public Health Department, and the Faculty of Medicine, Cairo, to Siwa Oasis, in January 1933, for the Study of Parasitic Infections, Malaria and Diphtheria.—21 pp With 3 figs and 3 folding maps. 1933. Cairo Ministry of the Interior, Public Health Department

The Siwa oasis is in the Libyan desert about 600 kilos to the north-west of Cairo, it is the site of the once famous temple of Jupiter Ammon. About 1,000 people, of Berber origin, dwell there. There are some 200 springs but most of the water is too salt to drink. Ninety-seven children, of 5 to 16 years, were examined for urinary and rectal bilharzia. None was found infected. The stools were examined by both smear and floatation methods, 96 per cent had ascaris ova; no other worm parasites. The inhabitants claim that every Siwan has the "abdominal serpent" (*Ascaris*). The method of disposal of excreta is by pit, the contents of which are removed at intervals in palm-leaves on donkey-back to fertilize the crops. The product mixed with sand is quite dry, which accounts for the absence of ankylostomes, ascaris ova are resistant to dryness. Bilharzia is present in Dakhla and Baharia oases, absent in the Siwa and Gara oases. The average amount of salt in these springs is, respectively, 205, 204, 2,330 and 7,074 p p m; i.e., there is 10 times as much salt in Siwa as in the first two. *Bulinus* will not live where there is much salt. For the prevention of ascaris it is proposed to treat the inhabitants once a year with oil of chenopodium.

Malaria was once very prevalent in Siwa and preventive measures were started in 1919. Now only three out of 104 had parasites (tertiary) in the blood, and only 7 of 167 children had enlarged spleens. Four species of anopheline are found in this and neighbouring oases; *A. multicolor* is believed to be the main carrier. The disease has been combated by the distribution of *Cyprinodon* fish in the ponds and water channels, which are kept free from vegetation. A. G. B.

HUMANN Notes sur les pratiques médicales des Kel Hoggar. [Notes on Medical Practice among the Kel Hoggar].—*Arch. Inst. Pasteur d'Algérie* 1933. Sept. Vol 11. No 3 pp. 465-512 With 1 plate [Refs. in footnotes]

The author resided two years in the Touareg country, in a mountainous region to the south of the Sahara at about 23°N. latitude. A description of it was recently published by FOLEY, a member of a scientific mission [see this *Bulletin*, Vol 29, p. 227].

He describes the ideas of medicine possessed by the tribe, their medical and surgical practices and thirdly their diseases as far as he was able to observe them. We are concerned here only with the pathology of this remote people. Malaria is found occasionally. Most cases have been contracted in the Soudan or the oases. Whether the disease is indigenous anywhere in this large territory stretching between the 20th and 25th degrees of latitude, and varying in altitude between 500 and 3,000 metres, is uncertain. Anopheles have been reported from three localities (*A. multicolor*, *A. hispaniola*, *A. costalis*, *A. maculipennis*). Research in three localities discovered no splenic enlargements. A European contracted undulant fever near Tamanrasset: whether this disease is general is unknown. Gonorrhoea is very common amongst the Touaregs; few escape it; in its early manifestations it is mild but it leads later to rheumatism and urethral stricture. Syphilis was never seen among the prostitutes though they

were regularly examined, and the congenital disease was rare, but the author considers syphilis to be not infrequent. Skin symptoms predominate over visceral and nervous.

Affections of the joints are very common. Probably they are often sequelae of gonorrhoea, but some cases yield to anti-syphilitic treatment. Pulmonary affections are common but tuberculosis is rare—the former are attributed to the combination of extreme cold (temperatures below zero are not rare) and scanty clothing. It is not an exaggeration, writes the author, to say that the Touareg die of cold.

Neither smallpox or typhus were seen and the latter seems to be unknown. The mode of living, in scattered groups of 5–6 tents, is not favourable to the spread of epidemic diseases. A. G. B.

ROUSSE. Notes de géographie médicale sur Tabelbala. [**Diseases of Tabelbala.**]—*Arch. Inst. Pasteur d'Algérie*. 1931. June. Vol 9. No 2. pp. 382–398. With 14 figs. on 7 plates & 1 plan.

This is another account of an oasis in the Sahara desert.

Tabelbala lies 140 kilometres to the south-west of Beni Abbés at 29°25'N. and 3°5'E. (of Greenwich). The configuration of the ground is such that its commercial relations have been chiefly with Morocco and the French Soudan. The palmery is some 5 kilometres long and about $\frac{1}{2}$ kilometer wide. The population is about 500. In July and August the average temperature in the houses is 37°, in the winter midday is hot but there is frost at night. Appreciable rain had not fallen in the years 1927–1930.

The people though underfed seem to be robust and resistant to disease. As in the neighbouring oases malaria is common but unimportant. In the palmery are wells and pools, the former mostly dry. In both mosquito larvae are found, identified by EDWARDS as *Culex* sp. perhaps *C. sergenti* Theo., and *Anopheles sergenti* Theo. (adults). The splenic index, determined in two ksars, showed 4 out of 30 palpable spleens in one, and 12 out of 41 in the other, or 22·5 per cent. in all.

Tuberculosis appears to be very uncommon, one pulmonary case was seen in a woman who had lived away with Europeans, returned and died after two months. The natives have only rare contacts with Europeans. The cuti-reaction was tested on about 200 persons and the results are tabulated according to age. In one ksar in 85 persons there were five positives all in 25 adults and in another in 133 persons there were 17 positives, all but three among 55 adults, i.e., 10·1 per cent. in all—a very low proportion.

Trachoma is common, 5 out of 30 at one ksar, 16 out of 55 at another. *Venereal disease* is rare.

A list of molluscs and insects collected includes *Limnea palustris* Müller and *Melanopsis Foureaui* Piry and *Phlebotomus papatasi*. [*Leishmaniasis* is not mentioned.] A. G. B.

GILLY (C.). Activité du service d'hygiène de la circonscription de Dakar pendant l'hivernage 1933 (1er juin au 1er décembre). [**Work of the Service d'Hygiène of Dakar District, June to December, 1933.**]—*Bull. Soc. Path. Exot.* 1934. Jan. 10. Vol. 27. No. 1. pp. 87–93.

This cold season was characterized by a recrudescence of both plague and malaria at Dakar and yellow fever at neighbouring places in Senegal.

Plague—In the first half of June there were only two cases recognized. An epidemic then began, as the table shows

Month	Human Plague				Total	Deaths	Rat Plague
	Form						
	Bubonic	Secondary pneumonic	Primary pneumonic	Septi- caemic			
June	24	8	8	6	46	35	6
July	13	2	3	2	20	16	9
August	5	0	0	0	5	2	1
Sept.	3	1	0	1	5	4	1
October	3	2	3	3	11	9	4
Nov	8	3	2	3	16	11	5
Total	56	16	16	15	103	77	26

All cases bacteriologically confirmed

Three foci were recognized, one of which was on the outskirts and one in Dakar itself. Investigations led the author to the conclusion that the disease was not spread from man to man, wherever human plague was detected corpses of rats and mice were found and in most of these the plague bacillus was recognized. There is a persistent focus among the wild rodents in one locality. The author inclines to think that the sand flea, *Synosternus pallidus*, which is very abundant at Dakar, plays a part in the spread of plague, but this has not been demonstrated. Most human cases occurred in wooden huts, the foundations of which, if of cement, were so defective that rats were numerous; 68 were obtained from one such house serving as a shop. The measures taken are detailed. Treatment consisted in a subcutaneous injection of an ampoule of bacteriophage together with 100 cc of antiplague serum (50 by a vein and 50 under the skin). The serum is repeated daily till recovery. Of 10 bubonics thus treated two died of secondary pneumonic plague and eight recovered. [The table seems to show that plague is not so fatal here as in other parts of Africa, e.g., the case fatality in Uganda (1931) was 93 per cent.]

Malaria—A table shows the incidence of malaria of each type during the same six months. There were 1,215 cases, the majority in August, September and October, 776 of subtertian, 406 of tertian and 33 of quartan, and 41 deaths, chiefly among native children. The author describes the antimalarial measures taken by the Service of Hygiene. Numerous wells were covered and others filled in and a swamp was obliterated in the same way.

Yellow fever—The action taken is described when a case occurred at Dakar in a man coming from a village 50 kilometres away. A. G. B.

DE LANGEN (C. D.). De beteekenis van de geographische pathologie voor het rassenprobleem in de geneeskunde. [The Significance of Geographical Pathology for the Race Problem in Medicine.]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1933. Aug. 15. Vol 73. No. 17. pp. 1026-1044.

The ground covered by the author is developed in an interesting manner and raises numerous questions of racial and geographical pathology. In reality race has nothing to do with nationality or the possession of a common language. An interest has been exhibited from very ancient times by the medical profession in this subject of the

real reasons for the difference among human groups, which are distinguished by form and size but above all by colour of skin, hair and eyes. The normal man with the Greeks, as he is with us, was regarded as in a state of equilibrium; disease is a disturbance of equilibrium and this equilibrium was regarded as based upon a proper admixture of the four humors, blood, slime, yellow and black bile. That special admixture, according to Hippocratic ideas, gave to every man his own peculiar constitution. The evolution of ideas on these lines is worked out by the author in some detail.

In due course he approaches the subject of the distribution of disease. Definite races were noted long ago to be differently affected by metabolic diseases—the Jews by diabetes and obesity, the Anglo-Saxon race by gout. Tropical pathology has for some time been treated as a separate field of investigation. Restriction of the field, however, to the tropics was much too circumscribed and it has been extended in recent years to include geographical pathology. Human beings, for example, over the whole world are separable into four groups according to the agglutinating properties of their red blood cells. In this conception we may almost see the resuscitation of the four-humor theory of Hippocrates. Many diseases have different degrees of prevalence in different parts of the world. Thus we find a comparative absence of gall stones in the Dutch East Indies and among African races. Gastric carcinoma is common in Europe but uncommon in the indigenous population of Java. The case is just the reverse for hepatic cirrhosis and cancer of the liver. Pernicious anaemia is a blood disease of specialized distribution. Sprue, a well known and common tropical affection is, nevertheless, practically not observed among the true inhabitants of the tropics but only among the representatives of other races who have come to live in the tropics. (But see this *Bulletin*, Vol. 29, pp 3 and 7.) Other diseases receive consideration from this point of view, blackwater fever, angina pectoris, scarlet fever, appendicitis, acute rheumatism, rickets, and so on.

Have not the glands of internal secretion a definite place in the critical appreciation of racial pathology? We know nowadays that the normal growth, the development of the secondary sex characters and puberty are not only dependent on the internal secretion of the sex glands but that they are also dependent on those of the thyroid, pancreas, suprarenal, hypophysis and epiphysis. The thyroid, from an anthropological point of view, must be regarded as the most important of all these glands, and on this basis the dweller in Eastern Asia belongs to a hypothyroid race (KEITH). With underfeeding there results an atrophy of the thyroid gland in animals (McCARRISON) and in a few generations rats can be obtained having thyroids of constant low weight. Temperature also has an influence on the thyroid gland. These are but a few of the points dealt with by the author in what he calls a rough sketch of the extent and importance of the medical questions which have a direct or indirect bearing upon racial or geographical pathology.

W. F. Harvey

SNIJDERS (E. P.). De tropische pathologie als vergelijkende pathologie. [*Tropical Pathology as Comparative Pathology.*—*Nederl.-Tijdschr. v. Geneesk.* 1933. Dec 30. Vol. 77. No. 52. pp. 5745–5758. [13 refs.]

Tropical pathology, says the author, is in no way different from the pathology of the temperate zone. It may show, however, a different

incidence, differing frequency and racial discrimination. Thus it may be studied as a branch of comparative pathology. This introduction leads the writer to a discussion of liver cirrhosis, primary liver cancer and the occurrence of gall stones in Javans.

It is very extraordinary that in a population in which the use of alcohol can be excluded as a factor, cirrhosis of the liver should be so common. The mortality from cirrhosis, for example, is about 10 times higher in Javans than in a European population of the same age and sex distribution—43 per 100,000 in Javan males as compared with 4.4 in Holland. Biliary cirrhosis on the other hand is rare and this may possibly be due to the rarity of gall stones. Another disease which is comparatively frequent in the Netherlands Indies is primary liver-cell carcinoma. Figures taken from the records of the central laboratory at Medan, for cancers examined, give 54 per cent primary liver cancers in Javans, 90 per cent of which occurred in cirrhotic livers. The association of primary liver cancer with cirrhosis is very high and well recognized in Europe also. We find the question—rightly or wrongly—asked. Why are malignant tumours so rare in the tropics? In any case the question should be split up into a series and altered to—Why is the localization of cancer so different in the tropics from that in Europe? Why is gastric cancer so rare in Javans? and why is primary liver cancer so common in tropical regions? Lastly it has been found that gall stones are rare in Java especially in Javanese women under the age of 50. In the autopsy records available only one true solitary cholesterol stone was found and that in a 50-year old Chinese. The great majority of the gall stones found contain little cholesterol, little calcium and abundant bile pigment. The reasons given for these differential distributions of disease are not yet very satisfactory.

W F Harvey

KOLLE (W) & PRIGGE (R) Die symptomlose Infektion [**Infection without Symptoms.**].—*Arch d Staatsinst f Exp Ther u d Georg Speyer-Hause zu Frankfurt a M.* 1933 No. 28 46 pp [2 pages of refs.]

The subject of this paper, infection without symptoms, raises questions of great importance, and, if the experimental facts, proved in the case of animals, are of general application, some modification and revision will be necessary of the current views on natural resistance, immunity, carriers and the like.

Drs. Kolle and Prigge include under the term infection all cases in which the causal agent can be found in the tissues or fluids of the body, on the mucous membranes and their accessory cavities, or in secretions and excretions. It will be seen that this definition is a very broad one, and that it would include such cases as cholera contacts, in whose digestive tracts the cholera bacillus grows as in a culture medium, and who discharge vibrios harmless to the carriers themselves, but virulent to others. It is usual to attribute the absence of symptoms in the carriers to a natural immunity that they possess, at any rate temporarily, to infection with cholera, but the true nature of such an immunity remains unexplained.

The authors have made a very complete experimental study of syphilis in the rabbit and mouse, and the results that they have obtained are of outstanding interest and significance.

About ten years ago, Kolle described how rabbits, which had received an injection of a bismuth salt, and in which an insoluble deposit had formed, failed to react like normal rabbits to a subsequent infection with syphilis; no chancres and no glandular enlargement occurred. Had the presence of the bismuth deposit destroyed the virus, or had infection really occurred, in spite of the absence of symptoms? To settle this point, the bismuth deposits were removed by operation, two to ten months after their formation, and the completeness of the removal was verified by means of X-rays. In a number of animals typical chancres developed about six weeks later, thus proving that infection had certainly occurred, though without any symptoms.

PEARCE and BROWN (*Jour. Exp. Med.*, Vol. 35, 1932) found that the popliteal lymphatic glands of untreated syphilitic rabbits always contain quantities of *Spirochaeta pallida*, even after the disappearance of obvious symptoms, by the inoculation of such lymphatic tissue into the testicle of normal rabbits, they produced primary syphilomas. Kolle and EVERS employed this method with the lymphatic glands of rabbits, which as the result of a previous bismuth injection, had failed to show any symptoms after the inoculation of syphilitic material; in many cases typical chancres developed in the normal rabbits.

The same authors then proceeded to determine whether syphilitic infection without symptoms occurred in animals which had not received therapeutic treatment. In experimental infection of rabbits with syphilis, it is found that, in about ten per cent. of the animals, neither chancres nor any other symptoms occur; such refractory animals are known in German laboratories as "Nuller" (blanks). The authors inoculated normal rabbits with the popliteal glands of these "Nuller," taken 80-200 days after the apparently negative infection; they found that typical chancres nearly always resulted in the normal rabbits. It is evident that the "Nuller" were in fact the subjects of a chronic infection without symptoms. In a few cases where the experiment failed, the normal rabbits, which did not show symptoms after inoculation, were probably themselves "Nuller"; and, indeed in some cases, spirochaetes were actually found in their popliteal glands. Whilst most of the "Nuller" remain permanently free from obvious manifestations of syphilis, occasionally chancres do develop after many months; a fact which confirms the view that the failure of infection in such animals is only an apparent one. It is possible that in man, too, syphilitic infection may occur without symptoms, Kolle and Prigge remark that this would explain the occurrence of tertiary symptoms without any history or evidence of primary symptoms, and the fact that mothers, who have always seemed to be quite healthy, may give birth to syphilitic children.

ALBRECHT found that rabbits, infected with syphilis without symptoms, can communicate the disease to other rabbits by coitus; the possibility of a similar transference of the disease by human beings, who have shown no symptoms, must be admitted.

Kolle and others have also been able to produce syphilitic infection without symptoms in rats and mice, by the insertion of portions of a chancre under the skin of the back; no chancre is formed, but, after some months, the lymphatic glandular tissue is found to be infective, for rabbits; and the disease can be transmitted from mouse to mouse always without manifest symptoms. Kolle and EVERS found that the guinea-pig, too, becomes infected without symptoms, and its subiliac glands are infective for rabbits.

Some of the most interesting and instructive experiments carried out by the authors were on superinfection in syphilis. When syphilitic rabbits, in which chancres have developed, are inoculated again, some 90 days later, with the same strain of the virus, no new chancres are formed, but, if a different strain of syphilis is used, chancres appear in about fifty per cent of the animals, from this the authors concluded that, in half the animals, some degree of immunity against a heterologous strain of virus is conferred by the original infection. Kolle then sought the answers to two questions, which, as he observes, are of great importance in the pathogenesis of human syphilis. —

(1) Can two different strains of syphilis exist in the body simultaneously?

(2) Are the animals, in which inoculation of a heterologous strain does not give rise to a chancre, actually immune to the strain; or is it only an apparent immunity, which, although it prevents chancre formation, permits the establishment of the spirochaetes in the body, in other words, is it an instance of infection without symptoms?

As the results of a well-planned series of experiments, it was found that two distinct strains of syphilis can co-exist, in a virulent condition, in the body of the rabbit, and that the immunity against a heterologous strain is only an immunity to chancre formation and does not prevent a general infection with the new strain.

The subject of superinfection in syphilis was carried a stage further, in order to ascertain whether the immunity of the rabbit to further infection with the same virus is also merely an apparent immunity, or whether it is possible for homologous spirochaetes to establish themselves in the body while the first infection lasts. A number of rabbits with well-developed chancres were treated during the latent period (4–7 months after infection) with small doses of neosalvarsan; the doses were too small to effect complete sterilization, but adequate to cause healing of the chancres, and to render the lymphatic glands, 66 days after treatment, non-infective for normal rabbits, when inoculated into the testicle. In another series of rabbits, treated as above, a second injection of the homologous strain was given, 31 days after treatment, without any chancres resulting. Thirty-five days later (*i.e.*, 66 days after treatment, the same period as in the controls), the subiliac lymphatic glands of these animals were used to inoculate normal rabbits; in 5 cases out of 9, the results were positive. The immunity which the rabbits of the second series showed against re-inoculation with the homologous virus, was only sufficient to prevent the formation of chancres, but not sufficient to prevent a secondary infection of the lymphatic system: there was, in fact, a homologous superinfection without symptoms.

It is impossible, within the limits of a review, to do more than refer briefly to a few of the subjects dealt with in this very instructive paper. The authors find that infection without symptoms occurs in many diseases, including many tropical ones, that this is the case is generally recognized, but, perhaps, sufficient heed has not always been paid to its great practical importance; and Drs. Kolle and Prigge, by their brilliant work, have brought clarity and precision to, and greatly extended our knowledge of the subject. The original paper will repay the careful attention and study of all who are concerned with the domains of pathology, therapeutics, prophylaxis, epidemiology and hygiene.

H. J. Walton.

- RABL (Rudolf) Geographisch-pathologische Untersuchungen ueber Ikterus, akute gelbe Leberatrophy, Leberzirrhosen und Cholelithiasis Ein Beitrag zu ihren Ursachen und Krankheitsbeziehungen [*Geographical and Pathological Investigations of Icterus, Acute Yellow Atrophy, and Cirrhosis of Liver and Cholelithiasis. Their Causes and Relations.*]*—Beirhefte z. Arch f. Schiffs- u Trop-Hyg* 1934 Vol 38 No 1 pp 1-80 (1-80)
With 2 figs [14 pages of refs]

Dr Rabl's monograph is a study of the geographical distribution, frequency and morbid anatomy of epidemic jaundice, acute yellow atrophy, cirrhosis of the liver and cholelithiasis. It is based mainly on postmortem examinations made in Russia and in Leipzig, but, where they are available, the records of other countries are also turned to account for purposes of comparison. The Russian statistics are for the years 1917-31, and include all the autopsies on persons above the age of 15, held in large general hospitals throughout the Soviet Union, where the pathologists have the right to perform postmortems on all patients who die in these institutions. About 100,000 Russian post-mortems are referred to in one of the tables, and the area from which they are derived is so vast, extending as it does from the Western European frontier to Irkutsk and Chita in the neighbourhood of Lake Baikal, that the most varied climatic conditions are included in it.

Many deaths from epidemic jaundice are reported from the Soviet Union, and several epidemics were confined to children. At the end of the War, and in the following years, epidemic jaundice showed a marked increase in Germany, and increases are also reported from other European countries and the United States of America.

About 150 cases of acute yellow atrophy are recorded in the Russian post-mortems. In Russia, as in Germany, it is commoner in young people, and especially in women. The cases in Leipzig and the Soviet Union confirm the connexion between acute yellow atrophy and pregnancy, salvarsan treatment and operations, which has often been noted. These conditions are certainly predisposing causes, but not the actual cause. The disease, in Russia, is more common in autumn and winter than at other seasons of the year, but no direct influence of the atmospheric temperature and humidity can be made out, nor is any definite association shown with gallstones, but antecedent attacks of typhoid and paratyphoid B are recorded with some frequency.

There are considerable variations in the frequency of cirrhosis of the liver in different countries, and even in different towns of the same country. Thus it is rare in Poland, Upsala and Basel, common in Java, Boston and Stockholm. In Leipzig a finely granular (? monobular) cirrhosis preponderates; in the Soviet Union a coarsely granular form (? polylobular) is more common. The influence of general nutrition, as a predisposing condition, seems to be decided, in Germany there was a decrease in the number of cases of cirrhosis during the War, and in most of the Soviet Union during the "hunger years," 1918-22. Climate cannot be considered a potent factor, for the condition is as common at Irkutsk, which has a very cold Siberian climate, as at Tashkent, with a subtropical temperature. Cirrhosis was often associated with cholelithiasis, but whereas cholelithiasis is much commoner in Germany than in Russia, the difference in the frequency of cirrhosis is very slight. There are considerable discrepancies between the observations of different pathologists as to the frequency of a positive Wassermann reaction in cases of cirrhosis; in

Leipzig, among 146 cases of cirrhosis, the reaction was positive in 13 and doubtful in 5. In the territory of the Soviet Union, cirrhosis is not more common in the malarious districts than in those where malaria does not occur. Inflammatory conditions of the alimentary canal, appendicitis, dysentery and tuberculosis are only rarely found, but some cases of cirrhosis are connected with diseases of the blood-vessels, thrombosis and endophlebitis of the hepatic veins, local and general arteriosclerosis and endocarditis. Abuse of alcohol certainly increases the tendency to cirrhosis, but is not the actual cause of it.

In the Soviet Union, gallstones are decidedly less common than in Germany. In Leningrad the percentage of gallstones in 10,969 post-mortems was 1.7. In Leipzig, during the same years, in 15,787 post-mortems the percentage was 8.7. The fact that the number of cases of cholelithiasis in Russia diminished decidedly after the years of war and famine, shows the influence of nutrition, latterly the disease has increased again. The differences in the incidence of gallstones among various races is largely a matter of mode of life and nutrition; the Jews appear to be especially prone to the disease. The association of gallstones and enteric fever has often been observed, and yet in the Soviet Union, where there is much enteric, gallstones are less frequent than in most other countries.

Dr Rabl's minute and almost exhaustive analysis of such numerous postmortem records shows the value of geographical pathology as a help towards the determination of the main factors in the etiology of diseases. The detailed study of individual cases, valuable as it is, rather tends, by reason of its actual thoroughness, to obscure the relative importance of the various conditions found, the value of which can only be gauged by a large scale survey like the present one. The postmortem reports are often silent on points that it would be of much interest to know, but their collective value is undoubted. Dr Rabl's paper is full of important facts and comparisons, the study of it can be strongly recommended to all who are interested in the subjects with which it deals.

H. J. Walton.

FAUST (Ernest Carroll). The Opportunity for Parasitology in the Medical Schools of the South.—*Southern Med. J.* 1933. Nov. Vol 26 No 11. pp 962-964

Dr. Faust points out that 20 to 25 per cent. of the patients seen by physicians in the southern U.S.A. harbour animal parasites; he considers that medical students in that area should have a course in medical parasitology preferably during the first clinical year. They should be in groups of not more than 25 and should be instructed by an adequately trained parasitologist in a properly equipped laboratory. The course should occupy 16 to 20 half days. Such a course is outlined.

A. G. B.

GILKES (Humphrey A.). Native Customs in Africa and the Medical Officer.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1933. Nov 30. Vol. 27. No. 3. pp 315-320.

This article treats of native customs and beliefs in Northern Rhodesia about menstruation and midwifery, initiation and taboos in respect to food and to infectious diseases. If the medical officer has

not some familiarity with these he cannot be successful. "He will never enjoy the complete confidence of his villagers until he has learned the medical customs of the tribes amongst whom he is working." The paper cannot be summarized but should be read. We may note here that an unsuccessful practitioner is not expected to ask for a fee, however hard he may have worked and however long a time he may have spent over a case

A. G. B

ARCHIVES OF MEDICAL HYDROLOGY 1934. Jan. Vol. 12 No 1
pp 209-220.—**Convalescence from Tropical Diseases, treated by Waters and Baths** [WAGNER (Fritz), PIERRET (Robert), FISCHER (Otto), EDGECOMBE (W.), BYAM (William), CASTRONUOVO (Giovanni)].

Treatment of tropical diseases by alkaline saline waters —

Dr. Wagner (Carlsbad) said that the chief spas treating the sequelae of tropical diseases or "tropical debility" in Czechoslovakia are Carlsbad, Marienbad and Franzensbad, the waters being mainly of the Glauber's salt type. He classes the cases as (1) chronic constipation, (2) "dietetic traumas," (3) intestinal sequelae of dysentery and malaria, (4) hepatic disorders. The treatment for each class of case is discussed.

Dr. Pierret (La Bourboule) gave the chief French spas for the treatment of tropical diseases as La Bourboule, Brides les Bains, Châtel-Guyon, Plombières, Vichy. A short account is given of each. Vichy is the most important, most of the Colonial patients there suffer from liver disorders: the waters are strongly bicarbonated. For malaria the spa recommended is La Bourboule, the arsenical water of which "undeniably exerts a specific antiparasitic action." The author states that the most important complication of malaria seen, both in numbers and seriousness, is hepatic cirrhosis, Vichy is the spa indicated. It is noted that the famous Plombières rectal douches are now almost abandoned at that spa.

Methods and machinery for treating tropical diseases —

Dr. Fischer (Tübingen) after reference to specialist diagnoses at Hamburg or Tübingen gives details of the health resorts and spas of Germany, *e.g.*, for anaemia after malaria or ankylostomiasis he suggests a spa with arsenical or chalybeate waters, such as Dürkheim, Homburg and Elster. He gives some space to social provision. Seamen insured in an approved society called the *Seekrankenkasse* are eligible for free treatment at German spas for tropical diseases, all of which are scheduled as diseases of occupation under Workmen's Compensation legislation. The insurance societies have established hostels at several spas.

Dr. Edgecombe (Harrogate) describes the objectives of spa treatment and gives the main characteristics of the British spas to which tropical convalescents may be sent, *viz.*, Bath, Buxton, Bridge of Allan, Cheltenham, Droitwich, Harrogate, Leamington, Llandrindod and Strathpeffer.

Dr. Byam (London) [whose article is the most useful of the bunch] drew attention to the fact that many tropical convalescents pass to regions on the coast where the climate is relaxing when they should go to more bracing spots and upland airs away from the sea. To make a suitable spa a success for the purpose of the tropical invalid there are three essentials—a practitioner with special knowledge of tropical parasites to act as pathologist, a well-equipped laboratory and a dietetic

centre, *i e*, an establishment which has the amenities of a hotel combined with the supervision of a nursing home.

The article on Italian spas is contributed by Dr. Castronuovo

A. G. B.

CONNELL (W K) & BUCHANAN (J C R) **Ulcers in the African Native. A Preliminary Investigation.**—*Trans. Roy. Soc. Trop. Med & Hyg* 1933 Nov 30. Vol 27. No 3. pp. 239-254 With 2 diagrams.

A careful survey of ulcers in 138 natives of Zanzibar, with a system of mensuration and recording of results, a comparison of various treatments and some remarks on etiology

The authors sought a safe ambulatory treatment generally applicable to ulcers and capable of easy application; surgical excision followed by grafting is therefore not considered. Their aim was to establish a standard of comparison for future work. Of the 138 persons 92 per cent were males and 79 per cent were between 10 and 30. Well remunerated classes were not represented, indeed 36 per cent. were unemployed. Many, however, were apparently in robust health. Twelve methods of treatment were employed for the 256 ulcers studied, but 56 of these were advanced in healing. Those most deserving of mention were plaster of Paris and zinc ointment, plaster of Paris and "Zipp" (Bipp with zinc ointment substituted for bismuth subnitrate), the same with specific drugs, White Robertson's wax, moist antiseptic dressings renewed daily were employed as a control for other methods. The authors came to the conclusion that the best treatment for the vast majority of ulcers was to "lock them up" inside a rigid, tight-fitting case. This does not interfere with the patient's work and provides for the development of local immunity and the protection of newly-formed epithelium, zipp with or without spirochaetocides was the most successful application. There is no smell and no excessive discharge. [The authors state that they had no failures with 53 cases treated with zipp and spirochaetocides, their table shows 67 treated and 14 untraced.] When the healing stage has been reached zipp may give place to White Robertson's wax which proved "the most effective application for promoting the rapid epithelization of healing-stage ulcers." They note here that no ulcer was described as healed unless it was completely epithelized.

Most methods of measurement of ulcers fail because of their great irregularity in shape. They used two and recommend the second.

"This is based on the calculation of the average rate of advance of the epithelium from the time treatment is started until healing is complete, and for the purpose of ready comparison this is reduced to, and recorded in, millimetres *per diem*. The area is estimated as in the first method by reproducing the ulcer on squared paper, and the length of the perimeter is then easily measured with an opisometer. Now, if the area of an ulcer is reduced to a hypothetical rectangle with a base equal to the length of the perimeter, the shorter side must represent the total advance of epithelium necessary to complete the healing, and this is obviously calculated by dividing the area by the perimeter. That figure divided by the number of days the ulcer took to heal will give the average daily advance."

An illustrative table and diagram are given.

The authors attribute the prevalence of ulcers among the badly remunerated classes to the unvaried and ill-balanced nature of their

diets, producing an "ulcer diathesis," and the comparative absence of females among the patients also to a dietetic cause, the African female's diet differing in certain essentials from that of the male, they do not admit that the less exposure to trauma will explain the difference. They note that these ulcers are clearly distinct from varicose ulcers, dependent on venous stasis, indeed in 45 per cent the affected leg was definitely the smaller. The results of the Wassermann and Kahn tests showed that only in 39 per cent could yaws or syphilis be ruled out but in their judgment this has little significance in the pathology of true tropical ulcer. From the statements of the patients it was concluded that half began with an injury and half did not. A diagram illustrates the sites of the leg ulcers; 76 per cent affected the foot, heel, ankle and lower third of leg. Skin overlying bulky muscles was practically free. They believe that the skin areas least subject to ulceration are those which are best supplied with arterial blood.

Appendices to this useful paper include tables of ulcer characteristics and other data, a comparison of rates of healing and formulae of preparations used in treatment. A. G. B.

BRUMMELKAMP (R.) Over de therapie van het *ulcus tropicum acutum* [**Treatment of Acute Tropical Ulcer.**—*Geneesk Tijdschr v Nederl-Indië* 1933 Oct 24. Vol 73 No. 22 pp. 1346-1351.

— De behandeling van chronische zweren met permanente warmte [**Treatment of Chronic Ulcers with Permanent Heat.**—*Ibid* pp 1352-1356 With 10 figs & 1 chart on 6 plates

In the first of these two communications the author shows how time may be saved in the healing of acute ulcers by the adoption of vigorous measures.

The non-surgical method consisted in the use of a bath of warm water, 1/5,000 pot permanganate and soda water. The bath was used once or twice a day for an hour, the pot permanganate acted both as disinfectant and deodorant, while the soda water acted by loosening detritus and so cleansing the ulcer surface. With these methods 3 per cent boric lotion compresses were combined and for this purpose wood wool was advantageously used. They were changed every 3 hours. A surgical cleansing was even more effective and was carried out under ethyl chloride anaesthesia. After removal of the surface and edges, the ulcer was well packed with iodoform gauze. On the following day the bandage was removed with the help of peroxide of hydrogen and a boric vaseline dressing applied. A healthy granulation tissue should develop in 1½ to 2 weeks. Healing may be greatly accelerated by Thiersch grafting. The total number of ulcers treated were 333 acute and 86 chronic. Of these 52 acute ulcers received epithelial transplants and 47, or 90 per cent, were successful.

In the second communication there is described the use of continuous heat as an accelerator of healing for the chronic ulcer, which so frequently succeeds the tropical ulcer.

This type of ulcer, with its pale grey flabby granulations, its stinking, sloughing, phagadenic surface, offers the greatest resistance to treatment. It is poor in blood supply, for its blood vessels have been strangled by excessive growth of fibrous tissue. It is to stimulate the access of blood to the part that the author has elaborated a method of applying continuous heat. An electric apparatus is used capable of exact regulation and the temperature is kept at 42°C. An ulcer which

had resisted treatment for 9 months was healed in 28 days. Others were healed by this thermophoric treatment in 3 weeks, 16 days, 18 days and 25 days, and had previously been treated unsuccessfully for 3 months, 7 months, 4 months and $1\frac{1}{2}$ months respectively. It would seem, therefore, that there is considerable justification for the use of this or a similar method of treatment.

W F. Harvey

BLACKABY (E J) Notes on the Treatment of Tropical Ulcer.—
Ann Med Rep on Health & Sanitary Condition of Nyasaland
Protectorate for Year ending 31st December, 1932 Appendix II
pp 61-62

Successful treatment of 15 cases of tropical ulcer by merely strapping

The author followed the method described by SAYERS [this *Bulletin*, Vol 30, p 36]. The ulcers, of one-fifteen years duration, all healed in 6 weeks or less, one involved two-thirds of the circumference of the leg above the angle.

"The ulcer is washed with saline, dried, and zinc-oxide strapping applied tightly twice round the foot and ankle in a figure of eight. It is then continued spirally round the limb with no reverses as far as the knee. By holding the spool in one hand, the difficulty of controlling the strapping ensures a tight application. No lint, gauze, antiseptic, or dressing of any kind is applied to the ulcer, the surface of which lies in contact with the sticky surface of the strapping. After three days or so, discharge soaks through to the surface and is removed by a moistened piece of cloth."

The author suggests elastoplast as preferable to strapping. The strapping is reapplied after 14 days. The patients continue their work, making in all three attendances. As to the rationale a rise of temperature in one patient retained in hospital suggested to his mind that the retained toxins may stimulate antibody formation. He thinks too there may be retention of bacteriophage in contact with the ulcerated surface. The advantages of the method are too obvious to state.

A G B

McGUIRE (Christie). Treatment of Tropical Phagedaenic Ulcer.—
[Memoranda.]—*Brit. Med. Jl* 1933. Nov 18. pp 918-919

This treatment consists in the thorough swabbing of the ulcer twice daily with a copper sulphate carbolic acid solution, followed by dusting with iodoform and bismuth subgallate powder. It has been used in tea-gardens for two years on over 2,000 cases of tropical ulcer.

"In making up the solution it is essential that the copper sulphate be completely dissolved in distilled water, leaving no deposit, this can only be achieved in a mortar. The carbolic acid is then added, the composition of the solution being copper sulphate $\frac{3}{4}$ ij, distilled water $\frac{3}{4}$ j, and carbolic acid $\frac{3}{4}$ j. As the carbolic acid rises to the top of the solution the latter must be shaken before use on each case. The purpose of the carbolic acid is to deaden the pain of the copper sulphate and allow thorough swabbing of the ulcer and removal of slough. After swabbing, the following powder should be applied and the ulcer covered with a piece of lint and a bandage: iodoform, 1 part; bismuth subgallate, 3 parts."

Pain and slough disappear in about 4 days and an average sized ulcer heals in two weeks. Treatment is painless. Swabbing is continued till healing is complete. In iodoform sensitive cases calomel is substituted.

A. G. B.

BLONDIN (P.) & RIOU (M.) Contribution au traitement de l'ulcère tropical. [Treatment of Tropical Ulcer.]—*Bull. Soc. Path. Exot* 1933 Dec 13 Vol 26. No 10. pp 1280-1284 With 1 fig.

RIOU (M.). Nouvelle technique de pansement des greffes épidermiques, son application au traitement des ulcères de jambe. [New Technique for Treatment of Epidermal Grafts.]—*Ibid* pp 1296-1301 With 2 figs.

1. The authors discuss the characters and treatment of phagedaenic ulcer. They describe the exudate which covers the ulcer; whatever the local treatment this exudate must be cleared away. For this purpose they employ a modification of the Carrel-Dakin method, in which fluid is dripped on the ulcer from a height of about 75 cm chlorinated soda or 30 per cent peroxide of hydrogen, 30 to 40 drops a minute. The first seance lasts 3-4 hours, succeeding ones, preferably night and morning, a shorter time, the strength of the dilution being reduced. In 2-4 days the base becomes healthy. Between times Pons's anti-phagedaenic lipo-vaccine is applied under moist and impermeable dressings. They have experience of some 400 cases.

ii Here Riou is dealing with chronic ulcers from various causes. The appropriate aetiological treatment is given and the ulcer cleansed. The grafts are taken by Reverdin's method. Pons's lipo-vaccine is applied to the grafted surface, a compress of two or three layers a little larger than the ulcer and soaked in lipo-vaccine. This is covered with a thin layer of absorbent wool well wrung out of boiling water, which makes the compress adhere to all parts of the ulcer and the whole is covered with impermeable paper dipped in a mixture of lead salts, wax and turpentine with a basis of linseed oil. This adheres to the skin around the ulcer and prevents any displacement of the grafts. The whole is kept in place with cotton wool and a bandage. The outer dressings are removed daily, the compress being kept wet with the lipo-vaccine. This is only removed after a week and then every 3-4 days. The patient must stay in bed for 8-10 days.

A. G. B.

MOREAU (P.). Note au sujet de cinq cas d'ulcères de nature vraisemblablement mycosique constatés à la Guyane. [Five Cases of Ulcer probably Mycotic in French Guiana.]—*Bull. Soc. Path. Exot.* 1933 Oct. 11. Vol 26. No. 8 pp 976-978

These ulcers were seen on convicts engaged in cutting and squaring timber in the forest in French Guiana. They occurred chiefly on the lower limbs, started as itching pimples, and were followed in two instances by small nodules under the skin, one of which broke down and gave issue to a glairy sero-pus. No satisfactory laboratory examination could be made, but the lesions yielded to full doses of iodide of potassium. They were regarded therefore as mycotic and a previous case of sporotrichosis from the forest country is mentioned.

A. G. B.

HUISMAN (R. G. J. P.) & MÜLLER (H.). Dermatitis ulcerovegetans (gyrata). [Dermatitis ulcero-vegetans (gyrata).]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1933. Aug. 1. Vol. 73. No. 16. pp. 985-991. With 5 figs. (4 on 2 plates). English summary (2 lines).

The authors, although aware of the tendency in dermatology to create new and somewhat artificial diseases, feel justified on clinical and

therapeutic grounds in differentiating the ulcers here described from the well-known chronic tropical ulcer Six cases were met with out of 723 ulcer patients in which chronic ulcers, solitary or multiple, were situated on legs or arms, showed concentric arrangement, were broken up like islands or peninsulas in the zone around the cicatricial centre and occurred in persons of upwards of fifty years of age

The term "vegetative" is applied to this dermatitis because, besides ulceration, there is also hypertrophy of the epidermis manifested macroscopically by the "island and peninsula" appearance and microscopically by acanthosis and increase in depth of the stratum granulosum There was no evidence of syphilis or yaws to account for the lesion, which appeared to be a chronic streptococcal affection. Microscopically the condition was essentially ulcerative and inflammatory, had nothing to show of malignancy and was characterized by great breaking up of the epidermis which had long strands extending into the cutis, disappearance of elastic tissue, acanthosis, parakeratosis and hyperkeratosis, and an inflammatory cell reaction of polymorph, round cell and giant cell type Therapeutically the ulceration yielded to the application of a 5-10 per cent salicylic acid ointment instead of the more usually employed 1-2 per cent Photographs are given of the clinical condition and the pathological anatomy *W F Harvey*

HUGHES (T A) Observations on Cirrhosis of the Liver as seen in the Punjab.—*Indian J. Med Res.* 1933 Oct. Vol 21. No 2 pp 353-360 [19 refs.]

An article bringing further evidence that malaria and cirrhosis of liver are causally connected.

The author, together with SHRIVASTAVA, six years ago expressed the opinion that malaria played an important part in setting up hepatic cirrhosis (see this *Bulletin*, Vol 25, p. 395) He has observed another 30 cases clinically and carried out autopsies on two of them, these form the basis of the present article

Cirrhosis of the liver seems to be fairly common in Northern India for 3 per cent of the total 7,911 admissions to the medical wards of the Mayo Hospital, Lahore, were on this account Both the clinical and the histological pictures are those of a polylobular cirrhosis The spleen may be large and "beefy" or shrunken and fibrotic, pigments, blood-derived and malarial, are frequently seen.

Certain biochemical features are described Bilirubinaemia is common, giving an indirect van den Bergh reaction varying from one to four units In eight of the patients (three of whom presented oedema of the legs) the blood proteins were estimated The albumin/globulin ratio varied from 1.4 to 0.53, or below normal in all. Seeing that the serum albumen was also subnormal, the author concludes that the oedema of the legs in hepatic cirrhosis is due to hypoproteinaemia as well as, if not more than, the pressure on the intra-abdominal veins and failure of the compensatory circulation.

The spleen, judged by results of the adrenalin test, seemed to have lost its contractility, or to have it much reduced. The leucocyte increase did not run parallel with the erythrocyte numbers and is probably due to influx from the lymphatic glands.

The clinical features are typical and need not be detailed. In the discussion regarding aetiology, Colonel Hughes considers other causes of cirrhosis—alcohol, syphilis, helminthiasis, amoebiasis, and diet—and partly by exclusion and negative evidence, partly by positive, the

pre-existence of malaria [an argument of doubtful value where malarial infection is common, apart from cirrhosis of liver] and the narration of a case in which the change was observed from chronic malaria with enlarged spleen and liver to cirrhosis of liver with ascites—comes to a conclusion confirmatory of his former opinion regarding malaria as a cause of cirrhosis [The subject is interesting and a difficult one, and much work yet remains to be done before it can be taken as proved that in a country where malaria is practically ubiquitous and cirrhosis of liver is "rather common" the latter is connected with the former as effect to cause.]

H. H. S.

RADHAKRISHNA RAO (M. V.). An Investigation into "Decompensated Portal Cirrhosis."—*Indian J. Med. Res.* 1933 Oct. Vol. 21. No. 2. pp. 389–416. With 3 figs. on 1 plate. [45 refs.]

This article may be regarded as complementary to the above and should be read and studied in connexion with it.

Sixty-four cases of portal obstruction with ascites, due to hepatic cirrhosis, admitted into the medical wards of the King George Hospital, Vizagapatam, are the subject of study. Protocols accompanying the article show that the condition is commonest among the poor and lower middle class Hindus, affects males more than females, usually between 20 and 50 years of age (6 were children), ryots (cultivators) by occupation.

Very few took alcohol to any extent, the diet of those affected differed in no way from that of others of the same class and caste.

Duration and course of the disease were difficult to determine since the majority of patients make but a short stay in hospital and cannot be followed up. The duration of life after the onset of ascites was ascertained in 14 fatal cases, one was less than one month, and only two lived for twelve months. Prognosis generally was bad, partly at least owing to the fact that the disease was usually in an advanced stage when admission was applied for, and partly because the stay in hospital was too brief for any but palliative treatment as a rule. The pathological findings were those of polylobular cirrhosis histologically, laboratory examinations showed the blood to be that of a secondary anaemia (e.g., r.b.c. 2,400,000, leucocytes 2,688 per cmm, Hb 45 per cent., C.I. 0.9), van den Bergh positive indirect or delayed direct was obtained in most. Many gave serological agglutination of one or other of the *Bact. dysenteriae*, even though no history of dysentery was obtained, 41 out of 55 patients gave a positive W.R., 28 of them strongly positive. The therapeutic use of arsenicals in the treatment of syphilis, it may be noted, may itself be a potent factor in causing portal cirrhosis.

Dr. Rao, quoting ROLLESTON and MCNEE, stresses the difficulty of determining between cirrhosis caused by malaria and cirrhosis in a malarial patient. It must be remembered too that such eminent authorities as OSLER, ROGERS and FAIRLEY are all opposed to the idea of advanced cirrhosis being due to malaria.

The diet in most patients was deficient in proteins, fats and vitamins, with excessive consumption of chillies or spices. Oral sepsis and "intestinal intoxication" were common to most of the patients, and the author points out the need for further investigation as to whether, and if so to what extent, focal infections or toxi-infectious processes

may play a part. As already stated field-workers showed a high incidence and the same has been reported from Lucknow, while "farmers' cirrhosis" is reported in North China.

The author concludes "Congenital syphilis and primary splenic anaemia were shown to be the chief aetiological factors in a few cases. The exact causation in the rest is far from clear, but it is pointed out that malaria, syphilis, dietetic errors and focal infections appear to be important aetiological factors. It is suggested that further investigation into the exact rôle of dietetic errors and focal infections may prove that the main type of the disease is probably of the nature of 'toxic cirrhosis'."

H. H. S.

LAHIRI (Subodh Chandra) Clinical and Experimental Investigation into the Aetiology of the Infantile Cirrhosis of the Liver.—*Calcutta Med JI* 1933 June. Vol 27. No. 12. pp 439-460, July & Aug. Vol. 28. Nos. 1 & 2 pp 22-37; 57-97 With 4 plates & 4 charts. [80 refs]

The author reviews the various theories that have been put forward of the etiology of infantile biliary cirrhosis. He experimented with rats in the National Medical Institute, Calcutta, and records his observations at considerable length. He reports 16 consecutive cases in infants, and tabulates the chief symptoms, results of cultures made from the urine, food given, etc., and reaches conclusions some of which are reproduced:—

"Sixteen consecutive cases presenting typical clinical pictures of infantile cirrhosis of the liver have been recorded here. On culturing the urine in these cases, 7 cases showed B. Coli, 6 cases showed streptococci and one case showed on one occasion B. Coli, and during a recrudescence of the disease, streptococci. In two cases the urine was sterile, in one of which blood culture showed haemolytic type of streptococci.

"Some sort of chronic gastro-intestinal disorder was present in all the cases. Gross dietetic errors were noticed in only a small number, but a history of irregular feeding was present in all, and this is unfortunately very common in Bengali households.

"Malaria, kala-azar, syphilis, tuberculosis, rickets and alcoholism could be excluded in all the cases.

"Three cases ended fatally. . . 4 cases, which were fairly advanced, were cured by vaccine injections when other measures failed. Rest of the cases were seen in rather early stages and responded to hygienic measures together with medicinal treatment, or change of places."

"**Conclusion.**—For the production of infantile hypertrophic biliary cirrhosis two factors seem to be necessary; first, the damage and devitalisation of the hepatic cells, and next, a slow infection, in most cases, with either B. Coli or streptococci.

"Normally, micro-organisms are being constantly carried away from the intestines and are being killed in the mesenteric nodes and the liver. In devitalised condition of the intestinal epithelium a greater number of bacteria will reach the liver, and cause a greater wear and tear of the liver cells. In cases where the hepatic cells have already been devitalised by long-continued dietetic errors or have been specially predisposed by heredity, or some other cause, they can no longer withstand the constant invasion of the intestinal micro-organisms. The colon bacilli, or streptococci, on gaining entrance into the liver, may now destroy the already damaged liver cells, and, at the same time, stimulate the connective tissue cells to increased growth, or what is more likely following the destruction of the more highly differentiated hepatic cells in unfavourable

circumstances, there occurs a replacement of these by fibrous tissue, though in favourable circumstances there might have been regeneration of the hepatic cells and 'restitutio ad integrum'." A G B

HULSHOFF (A. A.) Melioidosis. [**Melioidosis.**]—*Nederl Tijdschr v. Geneesk.* 1933. Dec. 16. Vol 77 No. 50. pp. 5638-5645.

A description is given by the author of the beginning, the ups and downs of the prolonged illness, the mistaken diagnosis and the final diagnosis of a case of chronic melioidosis

At the outset there was high temperature and for 1½ years a septic intermittent and remittent fever. Lung symptoms were a prominent feature, as also were a prostatic abscess and subcutaneous abscesses. The diagnoses considered were glanders, syphilis, tuberculosis and sporotrichosis and the correct finding was obtained by the cultivation of *Bact. whitmori*. The case forms the subject of discussion. Melioidosis may present itself as (1) an acute sepsis in which form it can be mistaken for malaria, plague or cholera; (2) a subacute septicaemia with a resemblance to malaria, tuberculosis, bronchopneumonia, endocarditis, or again with the development of abscesses in liver, lung, prostate or testicle; (3) a chronic form, suggesting tubercle or syphilis with obstinate subcutaneous abscesses and bone abscesses. Altogether about 70 cases have been described of which 10 were diagnosed during life.

W. F. Harvey

HULSHOFF (A. A.) Een geval van melioidosis [**A Case of Melioidosis.**]—*Geneesk Tijdschr v Nederl.-Indie* 1933 Sept 26. Vol 73. No 20. pp. 1218-1222.

The case described was one contracted in French Indo-China and was noteworthy for its chronicity and ultimate recovery. Symptoms, which may be summarized as intermittent and remittent fever, lung symptoms, prostatic and subcutaneous painful abscesses and hepatitis lasted for one and a-half years. Various possibilities, such as syphilis, tuberculosis, pneumonia, typhoid fever, a mycosis, sporotrichosis and sepsis were considered, before the isolation of *Bact whitmori* from the pus obtained by puncture of an abscess established the diagnosis. Treatment, which was ultimately successful, took the form of administration of iodine and mercury.

W. F. Harvey.

WILLIAMS (Cicely D.). **A Nutritional Disease of Childhood associated with a Maize Diet.**—*Arch. Dis. in Childhood.* 1933. Dec. Vol. 8. No. 48. pp. 423-433. With 7 figs. [Summary appears also in *Bulletin of Hygiene.*]

A well-marked syndrome, occurring in the Gold Coast Colony in children of both sexes of from 1 to 4 years of age, is described. The disease takes from 4 to 12 months to develop fully and there is always a history of deficient breast-feeding with supplementary feeding with maize products (known as arkasa and kenki) only. The skin lesions are characteristic, beginning as thickened dark patches on the ankles, knees, above the wrists and on the elbows. These patches strip off leaving a raw, pink area. There may be a slight oedema of the extremities; the mucous membranes are often ulcerated and in the late stages corneal ulcers are often present. The nervous system shows marked irritability but the reflexes are normal. The temperature is irregular,

the pulse rapid but there is no leucocytosis and no marked anaemia. There are no parasites in the blood, except where there is associated malaria. Vomiting is common and diarrhoea persistent in the later stages and wasting may be severe. The stools show undigested food but no ova or parasites. The liver and spleen may be enlarged. Post-mortem shows nothing definite except a very fatty, almost diffuent, liver and there may be some kidney degeneration. The disease can be readily distinguished from pink disease, pellagra, beriberi and pemphigus.

The cause is not known but is presumed to be dietetic. The patients were treated with an adequate diet, rich in vitamins, and in the early stages of the disease recovery took place, but those seen late died in spite of treatment. The most likely deficiency appears to be in some factor of breast milk or an amino-acid deficiency as maize was the only supplementary food. There was no clinical evidence pointing to lack of vitamins A, C, D or E but a deficiency of some part of the vitamin B complex cannot be excluded. The impression was gained that the most important elements in the dietetic treatment adopted were cod liver oil and a good brand of tinned milk.

H N H. Green.

NICHOLLS (Lucius). **Phrynodermia : a Condition due to Vitamin Deficiency.**—*Indian Med Gaz* 1933. Dec. Vol 68. No. 12 pp. 681-687. With 4 figs. [Summary appears also in *Bulletin of Hygiene*]

A very high sickness and high death rate (40 per 1,000) was noted in the inmates of a Ceylon prison. Investigation showed that most of the deaths were ascribed to dysentery but it was found that most of the sick prisoners showed one or more of the following signs:—skin eruption, neuritis and diarrhoea. It was found in most cases that the disease took the following form—it commenced as a papular dry skin, with subjective symptoms of mild neuritis, gradual loss of weight and, later, diarrhoea or dysentery started, usually becoming very acute. There was low pyrexia (up to 101°F). The skin eruption and neuritis became more marked and in two-thirds of the cases eye symptoms, of commencing keratomalacia, occurred. Some died a few days after the onset of dysentery, but in most diarrhoea became chronic, with intervals with normal stools. In the last stages emaciation was extreme, the skin very dry, advanced xerophthalmia or keratomalacia was present, and in a few cases, dementia. Most died; some, when apparently recovering, died suddenly. In two post-mortems acute dysentery was found in one, nothing characteristic in the other. Most cases occurred in those who had been in prison not more than 18 months. During this period a diet with the following constitution was given.—bread, 4 oz., rice, 18 oz., fish, 2½ oz., plantain, 2 oz., vegetables, 2 oz., dhall, 2 oz., jaggery (palm sugar), ½ oz., coconut, ½, lime, ½, onions, ½ oz., chillies, 2, pepper, 1/10 oz., salt, ¾ oz. The diet is obviously very deficient in fat-soluble vitamins and possibly in vitamin B₂. After the first year beef or liver (2 oz daily) is added to this diet, and this may account for the decline in the incidence of this disease after 18 months imprisonment. The author cannot find any reference in the literature to a disease with this combination of symptoms and proposes to name it phrynodermia (toad-skin). It is due to vitamin A deficiency but other food factors may be at fault.

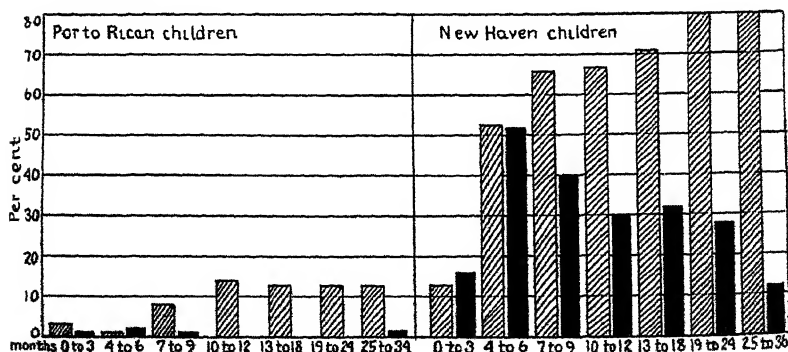
[No proof is given by prophylactic or curative methods that the disease is due to a vitamin deficiency, though it is quite obvious that the eye symptoms were due to a vitamin A deficiency, and it is quite probable from the experimental pathological facts of this deficiency disease that the neuritis, loss in weight and diarrhoea were due to this cause also. The skin eruption has been shown by other workers to be typical of vitamin A deficiency in man. Along with other recent clinical records the present one emphasizes the frequency and importance of this deficiency disease in tropical countries.]

H N H Green

ELIOT (Martha M.) & JACKSON (Edith B.). **Bone Development of Infants and Young Children in Puerto Rico. Roentgenographie and Clinical Study, with Special Reference to Rickets, Osteoporosis and Transverse Lines in Radius and Ulna.**—*Amer. J. Dis. Children.* 1933. Dec. Vol 46 No. 6 pp. 1237-1262 With 8 figs [18 refs.]

Rickets is a rare disease in most parts of the tropics. This paper contains a careful comparison of a series of infants in Porto Rico and a similar series in Connecticut, in which the diagnosis was made by both clinical and X-ray methods. The following is extracted from the authors' summary.

"A study of 584 Puerto Rican children from 1 to 34 months of age was made in order to observe the roentgenographic appearance of the bones of infants living under the influence of tropical sunlight and to make a comparison between the roentgenographic appearance of the bones of such infants and that of the bones of infants living in a temperate climate, i.e., New Haven, Conn. Detailed studies of growth and of the incidence of rickets, of osteoporosis and of transverse lines in the long bones are reported



Clinical and roentgenographic evidence of rickets at specified age periods in 584 Porto Rican children and in 956 New Haven children who had been given no specific treatment to prevent rickets. The diagonal lines represent clinical diagnosis; the solid black space, roentgen diagnosis.

[Reproduced from the *American Journal of Diseases of Children.*]

"Rickets is undoubtedly a rare disease in Puerto Rico. By roentgenographic examination only 5 cases of rickets were detected (less than 1 per cent. of the total). One was a case of frank severe rickets, that of a 7 month old infant who had lived all of his life in a stone cellar lighted only with electric light, and another, a case of healed rickets that had occurred when the child lived in New York City. Only 3 infants showed

changes in the bones comparable to those found commonly in New Haven and interpreted there as evidences of very slight or slight rickets. The almost complete absence in Puerto Rico of these slight deviations from the normal lends great weight to the opinion that they are in reality the earliest evidences of rickets, and that the interpretation placed on them in New Haven was correct. Since during the first six months of life (the period when these changes were most commonly found in New Haven) the rate of growth in weight and height of the Puerto Rican children paralleled closely that of children of continental United States, though at a slightly lower level, it is not likely that slower growth of the Puerto Rican children accounted for the absence in Puerto Rico of these deviations from the normal. It is believed that their absence in Puerto Rico may be attributed primarily to the protective influence of the sunlight and their presence in New Haven to inadequate protection by sunlight or by food containing vitamin D "

A G B

VAMPRE (E). Le "mal de engasgo" et son traitement chirurgical. [**"Mal de Engasgo" and its Surgical Treatment.**]*—Rev. Sud-Américaine de Méd. et de Chirurg.* 1933. July. Vol. 4. No. 7. pp. 493-518. With 16 figs

Mal de Engasgo or choking disease has long been known in Brazil and papers on this subject have from time to time been summarized in this *Bulletin* [e.g., Vol 18, p 301, Vol 24, p. 830]

It is reported with great frequency from the dry regions of the States of Bahia, Pernambuco and Piahy but is now rare in S Paulo State. It occurs at all ages but more usually between 20 and 30 years. Once acquired it is progressive but the spasm is intermittent. It is commoner in men than in women and may be seen in several members of a family. The onset is sudden or gradual. The difficulty of deglutition is progressive. Liquids are taken better than solids. Pain is infrequent. The author finds that the obstruction is in the last phase of swallowing, in the cardia; there is no spasm of the oesophagus. The cardia is defined as a canal which extends from the oesophageal gap in the diaphragm to the opening into the stomach and even a little beyond. At operation the narrowed portion of the oesophagus which is the size of a lead pencil measures 4-5 centimetres. The oesophagus under X-rays has the appearance of a large purse or pocket in which the food accumulates. The condition is due to a spasm of the cardia producing dilatation of the gullet. It is suggested that it is parasitic in origin; there are changes in the nervous system which have not yet been studied. The impression of all who have taken part in operations on the disease is that of a chronic inflammatory process round the cardia, one author has called it "chronic juxta-diaphragmatic perioesophagitis." It can be cured by Heller's operation, which is described at length and consists in laparotomy and resection of the muscular fibres of the cardia along two longitudinal lines without opening the oesophageal or gastric mucosa. Several radiographs are given and a case is described.

A. G B

KRÖBER (F.). Ueber ein eigenartiges Krankheitsbild bei afrikanischen Eingeborenen am Viktoriasee. [**A Peculiar Form of Disease in African Natives on the Victoria Nyanza.**]*—Arch. f. Schiffs- u. Trop.-Hyg.* 1933. Nov. Vol. 37. No. 11. pp. 484-496 With 13 figs. [20 refs.]

The author reports a disease of the bladder with fistulas and tumours, small and elephantoid, of that region, not bilharzial, in African natives

attending a mission hospital to the west of Lake Victoria, Tanganyika Territory.

In 4½ years he has seen 500 cases. Men are chiefly affected—always in the uro-genital system. The first symptoms are urethritis and cystitis, scalding on micturition with frequently blood at the end of the act and purulent discharge. Later come strictures in any part of the urethra, then infiltrations of urine, abscesses and fistulas which open in perineum, buttocks or scrotum. Tumours form at the fistulous openings, hard and irregular. The penis and scrotum become implicated; the scrotum may become enlarged to the size of a man's head (a photograph shows what appears to be a large elephantoid scrotum projecting between the legs behind). The urethra may be completely destroyed. In women the fistulas open on the perineum, labia or vagina; urethral stricture is unusual. At postmortem or operation the bladder is found to be inflamed, contracted, with wall thickened and ulcerated within. The urine is purulent and offensive with much cell detritus. No tumours have been seen in the bladder. The process extends to the ureters and pelves of the kidney, suppuration in which is the beginning of the end. Regular examinations of the bowel have failed to show any implication of that viscus.

All this suggests schistosomiasis but schistosome eggs have never been found in the urine; very early cases of the disease, however, are rarely seen. The natives say that the condition begins between the 20th and 25th year and lasts into the 5th decade [? 25 years duration]. A cystoscope was not available till the last few months. By its use in severe cases the bladder is found to have a very small capacity, there is trabecular formation with ulcers in the recesses and almost the whole mucous membrane is affected. The typical appearance of schistosomiasis (according to numerous writers)—sand grain layer, vesicle formation on the mucosa, papillomata—are wanting.

As above stated, schistosome eggs were repeatedly looked for in the urine. The only instances in which they were found were in persons from a distance who were not suffering from the disease in question. The author has examined much material obtained both at operation and at autopsy, at Tübingen and in the Hamburg Tropical Institute without elucidating the cause of the condition, though schistosome eggs were never found the histological picture was very similar to that of schistosomiasis. The author could obtain no evidence of schistosomiasis in this part of Africa, though he examined the urine of a series of boys for ova. He goes at length into the treatment he has practised.

[Before a schistosomal origin can be excluded with certainty the complement fixation and intradermal skin tests must be employed.]

A. G. B.

FOSHAY (Lee). **An Antiserum for the Treatment of Tularemia.**—*Jl. Amer. Med. Assoc.* 1933. Nov. 4. Vol. 101 No. 19. pp. 1447-1449. With 3 charts.

The results are given of the use in 69 patients of a serum obtained by inoculating goats with formalized suspensions of *Bact. tularensis* and are considered to be favourable. It was not possible, however, to show any antibody action on the specific bacteria nor was it possible to protect laboratory animals against infection even when large amounts of serum were used. The beneficial effect in man is attributed to reduction of inflammatory oedema and stimulation of phagocytosis.

Recommendations for the use of the serum are, early treatment, the use of two intravenous injections of 15 cc on successive days and serum made from virulent strains of the organism.

W. F. Harvey

BRUMMELKAMP (R) De maagzweer in Nederlandsch-Indië [**Gastric Ulcer in the Dutch East Indies.**].—*Nederl Tijdschr. v Geneesk.* 1933 Nov 4 Vol 77 No 44. pp 4982-4987. With 25 graphs English summary (6 lines)

The English conclusions of this paper, which deals with a subject that has been not infrequently discussed lately [*e g*, KOUWENAAR, this *Bulletin*, Vol 28, p 42] are as follows:—

"1 Peptic ulcer of the stomach is rare in the Javanese, notwithstanding the high acidity of their gastric juice

"2 This high acidity of the Javanese is only of short duration and probably therefore innocuous

"3 The possibility that a prolonged action of the gastric juice may damage the stomach wall, must be kept open"

A. G. B.

ROGERS (Leonard). **The Methods and Results of forecasting the Incidence of Cholera, Smallpox and Plague in India.**—*Trans Roy Soc. Trop Med & Hyg* 1933 Nov. 30 Vol. 27 No 3 pp 217-238. With 4 figs [17 refs] [Summary appears also in *Bulletin of Hygiene.*]

The author gives a general account of his previous laborious studies of the relationship between climatic conditions and the three great epidemic diseases of India, and discusses the success with which predictions of incidence have been made in the last three or four years [see *Bulletin of Hygiene*, 1927, Vol 2, 419, 1929, Vol 4, 117, 1931, Vol 6, 114 *bis*, 546]

Smallpox epidemics in India as a rule follow very material deficiencies in the monsoon rainfalls and absolute humidities. Forecasts for 1930-32 based upon this rule were more correct than might have been expected in such normal monsoon years, but the extent of the increased incidence in 1933 was, however, somewhat unexpected in view of the 1932 good monsoon and average absolute humidities. This indicates the necessity for further studies with a view to improving future results, and preliminary analysis suggests that saturation deficiency may give better predictions than the absolute humidity hitherto used. This factor also enters into the prediction of plague, a high incidence of which tends to follow low hot weather and monsoon temperatures and low saturation deficiencies of all seasons, and *vice versa*. Forecasts on this basis for the last four years and in different areas have given an appreciable number of correct results and appear to establish their value.

With cholera (apart from the major epidemics in famine years) deficient monsoon rains furnish the most important data in forecasting epidemics, and subsequent low winter and hot weather rains will increase the liability, but abundant winter rains will decrease it. The influence of the variations in the absolute humidity in relation to cholera incidence is just the opposite to that it exerts on smallpox, for it is a low absolute humidity in the winter and early spring months that inhibits or limits the occurrence of cholera. The essential fact is that cholera cannot be widely prevalent over a province unless the absolute humidity is near or over 0.400, and if the rise to or above this point is

delayed by a seasonally low absolute humidity an outbreak of cholera may be delayed or prevented. The most likely explanation appears to be a close correspondence in the dry winter months between absolute humidity and temperature and between low temperature and the viability of the cholera vibrio.

The results obtained with cholera forecasts have been good and it should therefore prove possible to foresee the danger spots and to take steps in good time to mitigate the disastrous epidemics of previous years with short winter rains following low monsoon ones.

A. Bradford Hill

NORONHA (A. J.). **Further Observations on Rhinosporidiosis.**—*Jl. Trop Med & Hyg.* 1933. Dec. 1. Vol. 36. No. 23 pp. 368-370. With 8 figs

A series of 8 photomicrographs is given in illustration of the statement that liberation of spores by a mature rhinosporidial sporangium may result in localized inflammation and sometimes in miliary abscesses [see this *Bulletin*, Vol. 30, p. 807].

W. F. Harvey

PALES. Les myosites et les pseudomyosites dans le milieu indigène en Afrique Equatoriale Française. [**Myositis and Pseudo Myositis in Natives of French Equatorial Africa.**]—*Ann. de Méd. et de Pharm. Colon* 1933 Oct-Nov-Dec Vol. 31 No. 4. pp. 512-530. [11 refs.]

This paper follows the arrangement of one on the same subject by HUARD [this *Bulletin*, Vol. 30, p. 49]. In 26 months at Brazzaville the author has seen 35 cases, all in natives. The pathogenic agents in all were staphylococci and pneumococci. In six cases there was no suppuration or very little and puncture was followed by recovery. In 9 cases the causative germ was not isolated but was probably staphylococcus. In 14 cases seeding of the pus gave a staphylococcus, and in 5 cases pneumococcus. Cases illustrating these points are described. Monomyositis was the rule, polymyositis the exception; in the latter there were 3 cases and 2 deaths. Glycaemia is shown to have no relation to myositis.

A. G. B.

DE JESUS (P. I.) & DE LEON (W.). **Studies on the Weights of Visceral Organs in Filipinos.**—*Philippine Jl Sci.* 1933. Oct Vol. 52 No. 2. pp. 97-98. [10 refs.]

—, — & ANZURES (P.). **Normal Weights of Visceral Organs in Filipino Children.**—*Ibid.* pp. 99-109. With 1 fig.

DE LEON (W.), GARCIA (Arturo) & DE JESUS (P. I.). **Normal Weights of Visceral Organs in Adult Filipinos.**—*Ibid.* pp. 111-118. [10 refs.]

DE JESUS (P. I.), DE LEON (W.) & RAMOS (J. M.). **Normal Weights of Visceral Organs in Filipinos in Relation to Length and Body Weight.**—*Ibid.* pp. 119-129. With 2 figs.

A series of papers in which the authors report on the weights of the principal visceral organs of normal and pathological cases in relation to age, length of body and body weight in Filipinos. More than 11,000 necropsy records between 1907 and 1924 were studied as well as 1,000 cases from the Department of Legal Medicine. They here deal with the normal weights in childhood and in adults, in relation to age, length and

body weight A further paper will treat of the weights in pathological conditions. The authors' object is to establish standards for Filipinos
A. G. B.

UHLENHUTH (Paul) Ueber die Entwicklung der Chemotherapie mit besonderer Berücksichtigung der modernen Arsen- und Antimonbehandlung [**The Development of Chemotherapy with Special Reference to the Modern Use of Arsenic and Antimony.**]
Deut Med Woch 1934 Jan. 19. Vol 60 No. 3. pp. 81-87.

In this address, delivered at the presentation of the Paul Ehrlich Gold Medal, the history of chemotherapy is reviewed from its empirical beginnings in the hands of PARACELSUS to its full scientific efflorescence under the guidance of EHRLICH A true aetiological therapy could only be instituted when the parasitic theory of disease had been firmly established by the work of PASTEUR and of KOCH The use of tri- and pentavalent compounds of arsenic and antimony is briefly discussed in relation to the treatment of trypanosomiasis, spirochaetoses, leishmania infections and bilharziasis with special insistence on the intimate relationship of chemical constitution and therapeutic activity. Reference is also made to the new arsenic antimony benzole preparation (386 B) which in Bartonella anaemia of rats gives a chemotherapeutic index of from 1 : 3,500 to 1 : 3,750 The discovery of this compound suggests that a specific cure has been found for Oroya fever and verruga peruviana.
G. M. Findlay.

UHLENHUTH (P) & SEIFFERT (W) Zur Chemotherapie der Bartonellenanämie der Ratte mit kombinierten Arsen-Antimonpräparaten. [**Treatment of Bartonella Anaemia of the Rat with Arsenic-Antimony Compounds.**]
Ztschr. f Immunitätsf u Experim. Therap 1933 Vol. 80. No. 3/4. pp 352-356

Two years ago the authors showed that whereas stibosan in rat anaemia had a therapeutic index of 1 : 8 and salvarsan one of 1 : 80, the index of arsenic-antimony compounds 283 and 246 lay between 1 : 300 and 1 : 500 They have now experimented with a new preparation "As + Sb 386B" and give the protocols. The chemotherapeutic index reached the remarkable figure of 1 : 3,500, i.e., the lethal dose was 75 mgm. per 100 gm rat and the curative 0.02 mgm. Relapses eventually took place but there may have been reinfections
A. G. B.

SCRIMGEOUR (H). **A Fever with Rash of Unknown Origin.**—*Malayan Med. Jl* 1932. Dec. Vol 7. No. 4. pp. 137-140.

Cases of dengue-like fever of mild type are common in Malaya but the case reported is unique in the author's experience.

- " 1. Continued fever for 37 days with fatal termination.
- " 2 Jaundice occurring on the twentieth day of illness followed by enlargement of the liver.
- " 3 A severe maculo-papular rash appearing on the third day of illness, becoming purpuric before it fades, recurring with a curious periodicity and followed after the third cycle by desquamation.
- " 4. Leucopenia with eosinophilia.
- " 5. No enlargement of the spleen or lymph glands."

Widal, Weil-Felix and Wassermann reactions negative ; no malarial parasites seen.
D. Harvey.

DOBELL (Clifford). **Researches on the Intestinal Protozoa of Monkeys and Man. V. The *Endolimax* of Macaques.**—*Parasitology*. 1933. Dec. Vol 25 No 4 pp 436-467. [30 refs.]

The paper deals in an exhaustive manner with experiments and observations on amoebae of the genus *Endolimax* from certain monkeys. The organisms have been studied in the intestinal contents, have been isolated in cultures and investigated there, while one strain from a *Macacus sinicus* has been passed to man and thence back to a *Macacus rhesus*. To be appreciated, the records given by the author with his customary precision must be studied in detail. They undoubtedly justify his conclusion that the amoebae studied by him from three species of *Macacus* are identical with *Endolimax nana* of man. One point, however, has not been settled and that is the question of the origin of the amoebae which occur in monkeys which have been in captivity for some time. After capture, during confinement and ultimate transportation overseas many opportunities must occur for susceptible monkeys to contract infections from human beings, and even before capture if they have lived in the vicinity of human habitations. This difficulty was realized by HEGNER and CHU (this *Bulletin*, Vol 28, p 482) who attempted to solve it by the examination in the Philippine Islands of wild *Macacus philippinensis*. Protozoa morphologically indistinguishable from all the common intestinal protozoa of man were found in one or other of 44 monkeys examined. The authors admit, however, that they cannot exclude the possibility of these protozoa being actually human strains acquired at the same time through the monkeys' association with man. C M Wenyon.

BECKER (Elery R). **Host-Specificity and Specificity of Animal Parasites.**—*Amer J Trop. Med* 1933 Sept. Vol. 13. No. 5. pp. 505-523

Recent investigations have tended to show that the rigid limitation of a particular parasite to a particular host cannot be accepted as a general rule. It is becoming more and more recognized that a single parasite may have a number of hosts which are not necessarily closely related. A general discussion of the factors controlling this limited host specificity, eleven of which are mentioned, leads to the general conclusion that host specificity becomes interpretable in terms of known physiological phenomena. C. M. W.

BROWN (H. C.). **Further Observations on the Electric Charge of the Erythrocytes in Certain Protozoal Diseases.**—*Brit. J. Experim Path.* 1933. Dec. Vol. 14. No. 6. pp. 413-421 With 1 fig. [24 refs.]

Continuing his observations on changes in the electric charge of cells, the author has found that in bird malaria, when the infection is being successfully controlled by the protective mechanism of the bird, the negative charge of the red cells is considerably lowered. When, however, the infection is developing steadily there is little or no change. The same thing occurs, but to a less extent, in mice recovering from an infection with *Trypanosoma equiperdum*. It is brought about by the action on the red cells of euglobulin which is increased in these and other infections. The suggestion is made that in malarial therapy of general

paralysis the euglobulin, increased by the malarial infection, may lead to the reduction in charge of the spirochaetes and their consequent phagocytosis
C M W.

LWOFF (Marguerite) Recherches sur la nutrition des trypanosomides. [The Nutrition of the Trypanosomidae.]—*Ann. Inst. Pasteur*. 1933. July. Vol 51 No 1 pp 55–116. [72 refs.]

In this lengthy account of investigations into the food requirements of certain leptomonads as grown in culture media it is shown that they resemble the free living ciliate *Glaucoma piriformis* in that the products of the hydrolysis of proteids are necessary for their growth and multiplication. One of the forms studied (*Strigomonas oncopelti*) like *Glaucoma piriformis* is able to content itself with solutions of peptone. The others, in common with Trypanosomidae in general, require in addition a certain but variable quantity of blood. Tests show that it is iron in an active condition that is required from the blood and in this respect the flagellates tested resemble the haemophilic bacteria. The hypothesis is advanced that the iron is necessary because of a certain deficiency of respiratory ferments
C M. W.

HOGUE (M. J.). A New Variety of *Retortamonas* (*Embadomonas*) *intestinalis* from Man.—*Amer. J. Hyg.* 1933 Sept. Vol 18. No. 2 pp 433–441 With 16 figs on 1 plate. [11 refs.]

From a sample of human faeces heavily infected with small flagellates the author cultivated a form of *Retortamonas* (*Embadomonas*) which differed in certain respects from *R. (E.) intestinalis*. Instead of being unequal the two flagella are of the same length and thickness while the cysts differ as regards the structure of the nucleus. Unlike *R. intestinalis* the flagellate will not grow in ovo-mucoid media, though it thrives in sodium chloride sheep serum water
C. M. W.

THOMSON (J. Gordon). The Natural Occurrence of Flagellates of the Subgenus *Strigomonas* M. and A. Lwoff in the Gut of *Tabanus africanus* from Nyasaland and *Lucilia serricata* in England.—*Jl. Trop. Med. & Hyg.* 1933 Dec. 1. Vol 36 No. 23 pp 361–365 With 46 figs. on 1 plate

It was generally supposed that all the leptomonas flagellates of insects and plants were structurally identical till THOMSON (1930) pointed out that *Herpetomonas culicidarum* of NOGUCHI and TILDEN (1926) differed from the conventional form in having a truncated or depressed anterior end and a peculiar flagellar movement. CLEVELAND and COLLIER (1930) noted that the flagellates studied by NOGUCHI and TILDEN differed culturally from the leptomonas of the flea, leishmania and trypanosomes in their ability to grow in blood-free media and suggested they all belonged to one species. LWOFF (1931) working with one of them (*H. oncopelti*) found that in addition to the peculiarity of the anterior end and the flagellar movement it had a striated body surface and decided to place it in a new genus *Strigomonas*. The author of the paper under review has now found flagellates of this genus in the flies mentioned in the title. Furthermore, examination of a number of NOGUCHI and TILDEN's original strains, which he has kept in culture, has shown that they are all *Strigomonas*. It seems, therefore, that

whatever they may have been originally they now differ from ordinary leptomonads. The suggestion is made that NOGUCHI and TILDEN may have been dealing with mixed infections and that in course of time the Strigomonas, not at first evident, has gradually gained the upper hand in the cultures. Whatever may be the explanation, it is evident that in future observers dealing with insect flagellates will have to differentiate between leptomonads and strigomonads. Many of the previous records may have confused these two forms. C M W

- 1 WOLFF (J. W.). Het voorkomen van Eimeria-Oöcysten in menschelijke ontlasting. [**Eimeria Oocysts in Human Stools.**]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1933 June 20 Vol. 73. No 13. pp. 813-814. With 1 fig.
- 11 KRIJGSMAN (B. J.). Het lot van Eimeria-oöcysten in het darmkanaal van den mensch.—*Ibid* Aug. 15 No 17 pp. 1070-1072 [16 refs.]

i. In the stool of a patient sent to the laboratory for examination for amoebic cysts were found fully developed oocysts of a species of *Eimeria* measuring 45 to 50 μ in diameter. The occurrence of the oocysts of fish coccidia (*E. clupearum* and *E. sardinae*) in human faeces is discussed and it is noted that the patient had eaten fish the day before the examination was made.

ii. The author of the second paper notes that the coccidium corresponds with *E. sardinae* (*E. oxyspora*) and points out that the passage of the oocysts through the human intestine is likely to occur only when some intestinal derangement produces a deficiency of the digestive juices which normally destroy the oocysts. Otherwise these oocysts of fish coccidia would be found more frequently in human faeces.

C. M. W.

- BOUGHTON (Donald C.). Diurnal Gametic Periodicity in Avian *Isospora*.—*Amer. Jl. Hyg* 1933 July. Vol. 18. No. 1. pp. 161-184. With 4 diagrams [14 refs.]

Examination of the droppings of English sparrows infected with coccidia of the genus *Isospora* shows that under ordinary daylight conditions oocysts appear in those droppings which are passed during the hours 3 p.m. to 8 p.m. If the light and dark conditions to which the birds are exposed are artificially reversed, after three to five days the time of oocyst appearance changes to 3 a.m. to 8 a.m. This diurnal periodicity, which seems to be correlated with the rest period of the bird, is the first instance to be recorded of periodicity for the sexual phase of a sporozoon.

C. M. W.

- COATNEY (G. Robert). Relapse and Associated Phenomena in the Haemoproteus Infection of the Pigeon.—*Amer. Jl. Hyg.* 1933. July. Vol. 18. No. 1. pp. 133-160 With 7 figs. [20 refs.]

The young forms of *Haemoproteus columbae* first appear in the blood of pigeons 28 to 30 days after exposure to the bites of infected flies (*Pseudolynchia maura*). The parasites in the blood increase steadily in number (acute phase) and then decline (crisis) till only a few remain (chronic phase). They may apparently disappear entirely from the blood (latent phase). The latent phase does not always follow the chronic phase as relapse may occur before this stage is reached. If

relapse does not occur during the chronic phase it does so after the latent phase has lasted a few days. After relapse the same phases occur as in the primary attack but the infections are less intense. The relapses occur very irregularly and have nothing to do with any parasite periodicity. If a bird recovers entirely from infection, as it may, it is susceptible to reinfection. Birds differ from one another considerably as regards the intensity of infections produced. In one with one-third of the red cells infected the parasites appeared to be pathogenic. It was not possible to provoke relapse by artificial means. In one instance infection was transferred to a healthy pigeon by injection of lung tissue. It was not possible to infect mourning doves (*Zenaidura macroura carolinensis*) with the pigeon parasite though the bird is a favourable host for the fly. C. M. W.

MELENEY (Henry E.) The Relative Incidence of Intestinal Parasites in Hospital Patients in Nashville and in Rural Tennessee.—*Jl. Lab. & Clin Med.* 1933. Nov Vol 19 No. 2 pp. 113-119.

This report is a summary of the routine faecal examinations made in the Department of Preventive Medicine of the Vanderbilt Medical School, Tennessee, between January 1930 and June 1932. Of the 2,112 whites and negroes examined 1,231 were adult medical out-patients. The results give the incidence of parasites from the combined urban and rural population of middle Tennessee.

The technique comprised, a heavy smear in saline for *Strongyloides* larvae and helminth eggs, a thin smear in saline for motile protozoa, a salt-floatation for helminth eggs, emulsification and centrifugation with subsequent addition of iodine eosin for protozoan cysts, and in some instances staining of smears with iron haematoxylin. There was one faecal examination per person. Table I (abridged) gives the results

Summary of Faecal Examinations on 2,112 Patients in Vanderbilt Hospital, January 1, 1930 to June 30, 1932

	Total	
	No pos	Per cent pos
One or more parasites .	642	30.4
<i>Endamoeba histolytica</i> .	63	3.0
<i>Endamoeba coli</i> .	269	12.7
<i>Endolimax nana</i> . . .	153	7.3
<i>Iodamoeba butschlii</i> . . .	68	3.2
<i>Giardia lamblia</i>	115	5.5
<i>Chilomastix mesnili</i>	73	3.5
<i>Trichomonas hominis</i>	35	1.7
<i>Enteromonas hominis</i>	6	0.3
<i>Ascaris lumbricoides</i>	53	2.5
<i>Trichuris trichura</i>	22	1.0
Hookworm	24	1.1
<i>Hymenolepis nana</i>	24	1.1
<i>Strongyloides stercoralis</i>	14	0.7
<i>Enterobius vermicularis</i>	3	0.14

Of the *E. histolytica* persons only two had dysentery, and in 57 cysts only were found. The frequency of *Strongyloides* shows that this

parasite is of some importance in Tennessee. Another table compares the results of the Nashville protozoal examinations with those from Chicago, Baltimore and New Orleans. In this Baltimore has the lowest incidence, then Chicago, then Nashville and New Orleans highest [see this *Bulletin*, Vol. 26, p. 870 and Vol. 28, pp. 784 and 785], as one would expect the incidence is progressively higher from north to south.

Table 3 compares the incidence at the Vanderbilt Hospital, Nashville, with that of the rural population both near and far.

Incidence of Human Intestinal Parasites in Vanderbilt Hospital Patients and in the Rural Population of Tennessee

	Protozoa						Helminths			
	<i>E. histolytica</i>	<i>E. coli</i>	<i>E. nana</i>	<i>Iodamoeba</i>	<i>Giardia</i>	<i>Chlamydomonas</i>	<i>Ascaris</i>	<i>Trichuris</i>	Hookworm	<i>Hymenolepis nana</i>
Vanderbilt Hospital	3 0	12 7	7 3	3 2	5 5	3 5	2 5	1 0	1 1	1 1
Rural population of eight surrounding counties	9 5	32 0	13 3	4 3	15 0	3 5	16 7	2 5	0 2	1 8
Rural Tennessee as a whole	11 4	32 1	11 9	4 1	14 7	2 9	27 1	7 6	6 8	2 9

It is seen that the incidence of almost every parasite is higher in the rural area than in the Vanderbilt hospital, which is partly explained by the rural survey having been mainly among children. Not so, however, for amoebiasis, which is known to be heaviest among adults, and here the explanation probably is that hygiene is better in the city. The author notes the dictum of CRAIG that "the great source of infection in this country [U.S.A.] is the foodhandler in public eating places." The author's figures indicate on the other hand that the conditions for transmission of the dysentery amoeba are much more favourable in the rural districts than in the cities.

A. G. B.

PIROT (R.) & LE MOULT. Parasitisme intestinal chez les soldats indigènes de race noire en garnison à Toulon. [**Intestinal Parasitism in Senegalese garrisoned at Toulon.**—*Bull. Soc. Path. Exot.* 1933. Nov. 8. Vol. 26. No. 9. pp. 1162–1166.]

In 1932 Pirot studied the intestinal parasites of Europeans of Toulon [this *Bulletin*, Vol. 29, p. 404]. This paper concerns the parasites of 100 Senegalese stationed at Toulon who were admitted to hospital for various causes. More than 300 examinations were made.

The table gives the findings (to which those of the former paper have been added); 90 were parasitized; parasites totalled 175.

Helminths.—All but 17 had ankylostome eggs. Concerning the 17 the authors say that after five years in France the native only exceptionally harbours ankylostomes. Though they persist in the European the native seems to clear himself unless he is submitted to successive

reinfestations Similarly with *Ascaris* and *Trichocephalus* the infestation of the native tends to fall and to approach that of his white neighbours. This is not the case with *Strongyloides*, *Taenia*, and *Schistosoma*, met with only exceptionally in the Toulonese. It is usually taught that *Taenia* eggs are never found in the stools. In 11 instances here the diagnosis was made on microscopic examination, not on the passage of segments and the eggs were found spread throughout the faeces, in every case the tape worm was unarmed.

The finding of *Schistosoma* requires patience and repeated examinations, the authors think that the figure of 13 per cent is probably less than the truth. *S. mansoni* causes in the black man severe intestinal symptoms with profuse and alarming haemorrhage, in one case fatal, the passage of ova is irregularly cyclical. In old cases search for eggs may be always negative in spite of rectoscopic examination and rectal prolapse. Relapses are frequent. Emetine is useless but antimonial salts are rapidly effective. There is no tendency to recovery in temperate climates.

Protozoa—With the exception of *Endolimax nana* protozoal infections were less numerous than among the Toulonese.

	Senegalese Per cent	Toulonese Per cent
1 Helminths —		
Trichocephalus eggs	20	13.6
Ascaris eggs	9	2.8
Strongyloides larvae	4	—
Ankylostome eggs	83	0.4
Taenia saginata embryophores	13	0.6
Schistosoma mansoni eggs	13	—
2 Protozoa —		
Entamoeba histolytica cysts	4	6.4*
Endolimax nana cysts	5	0.4
Entamoeba coli cysts	23	9.2
Giardia intestinalis cysts	1	3.8

* And 2.2 vegetative

A. G. B.

HECHT (Otto). Die Blutnahrung, die Erzeugung der Eier und die Ueberwinterung der Stechmückenweibchen [Blood Feeding, Production of Eggs and Hibernation in Female Mosquitoes.]—Beihfte z Arch. f Schiffs- u. Trop.-Hyg 1933. Vol 37 No 3 pp. 129–211 (5–87). With 1 fig. [6 pages of refs.]

In this lengthy paper, the scope of which is sufficiently indicated by its title, the author provides an admirable résumé, accompanied by discussion, of the chief published results of the modern experimental method of studying mosquito bionomics.

While much space is naturally devoted to the ordinary European laboratory mosquitoes, *Anopheles maculipennis* and *Culex pipiens*, the behaviour of *Theobaldia annulata*, *Aedes aegypti*, and the anophelines of North and South America, the Punjab and Southern Rhodesia is also under review.

As regards hibernation, after summarizing the statements of other authors with reference to *C. pipiens*, Hecht concludes that in this species the phenomenon is merely a result of low temperature, whereas in *A. maculipennis* it is a normal part of the life-cycle largely independent of temperature, although the actual cause is as yet unknown. Hecht thus rejects ROUBAUD's theory of auto-intoxication (due to overloaded Malpighian tubules) as the explanation of the diapause exhibited by overwintering females of *A. maculipennis*.

To all concerned with the problems presented by mosquito bionomy this able conspectus will be of material assistance, and the announcement in the foreword that the author finds himself compelled to sever his connection with medical entomology will be received with general regret.

E E Austen

SIMMONDS (H. W.). **The House-Fly Problem in Fiji.**—*Fiji Ann. Med. & Health Rep. for Year 1932.* pp 46-53

The narrow-fronted house-fly, called by PATTON *Musca vicina*, is less common nowadays in parts of the Fiji Islands, is abundant and troublesome in the Rewa Valley and elsewhere, including at certain seasons particular areas of Suva itself. Contrary to the habit of *M. domestica* in the British Islands, the insect breeds normally in cow-dung, its eggs being laid in depressions in the crust on droppings from 4 to possibly 24 hours old, lying in the sun, a single dropping may subsequently contain 2,000 larvae. It also breeds in human faeces, stable manure and the city refuse dump in Suva, and it is noteworthy that the routine practice of burning the last-added layer of the dump does not destroy the contained maggots. The notoriously filthy habits of the common house-fly are faithfully reproduced in Fiji. While in restricted areas the pest might be controlled by spreading cow-dung at least twice a week, so as to ensure rapid desiccation, the author considers that large-scale natural control would perhaps be secured by enlisting the aid of dung-burying beetles (as at present being tried in Hawaii for the control of the horn-fly, *Lyperosia irritans*), which presumably would have to be introduced *en masse* for the purpose.

E. E. A.

- i. D'UBY (P. Dupuy). A propos d'un nouveau cas de myiase oculaire à *Oestrus ovis* observé à Alger. [A New Case of Ocular Myiasis caused by *Oestrus ovis*, observed at Algiers.]—*Arch. Inst. Pasteur d'Algérie*. 1931. Dec. Vol. 9. No 4 pp. 630-637. With 2 figs. [10 refs.]
- ii. TRABUT (G). Un cas de myiase oculaire à *Oestrus ovis* à Alger. —*Ibid.* p. 638.

Many years ago the brothers SERGENT drew attention to a form of myiasis chiefly affecting the conjunctiva, due to larvae of the sheep bot-fly (*Oe. ovis*), of fairly frequent occurrence in Algeria, and known among the Kabyles and Touaregs respectively as *Thim'm* and *Tammé*. The insect while on the wing deposits its living larvae in the eyes or nostrils, or on the lips. It would seem probable that the fly's attacks upon man generally happen when sheep are few, and the human population is fairly dense.

The victims in the cases recorded in the papers under review were two natives and a European, who each experienced the usual sensations

produced by the sudden intrusion of a foreign body into the eye. The larvae—seven or eight in number in one instance—were all in the first instar and were removed with little difficulty, whereupon the inflammatory symptoms in the patients' eyes readily yielded to simple treatment
E E A

CUSHING (Emory C) & PATTON (W S) **Studies on the Higher Diptera of Medical and Veterinary Importance. *Cochliomyia americana* sp. nov., the Screw-Worm Fly of the New World.**—*Ann Trop. Med & Parasit.* 1933 Dec 20. Vol 27 No. 4. pp. 539–551 With 7 figs

The notorious myiasis-producer hitherto known as *Cochliomyia* (*Chrysomya*) *macellaria* would seem to have been wrongly identified. By examination of the male terminalia, a series of blow-flies trapped in Texas proved to be specifically distinct from a second series of deceptively similar flies bred at the same time and place from larvae in wounds in cattle. The members of the former group were true *C. macellaria*, which the authors therefore conclude is either harmless, or at most "a very doubtful myiasis-producing fly" In the belief that the species represented by the flies from the cattle, which is doubtless the real cause of nasopharyngeal and other forms of myiasis in man and animals in the Americas, is as yet undescribed, the authors characterize it under the name given above

[Assuming that the "*Musca*" *macellaria* of Fabricius has now been correctly interpreted, it would seem probable that this species is not a cause of myiasis, and that the designation "Screw-worm Fly" has been applied to it in error On the other hand it has been suggested by COLLIN (in a verbal communication to the present reviewer), with evident truth, that the supposedly new species is identical with "*Lucilia*" *hominivorax*, which was described by COQUEREL so long ago as 1858 Should no other name be proved to possess priority, the American producer of myiasis must therefore be known henceforth as *Cochliomyia hominivorax*, Coq]
E E A

LEFROU (G) A propos de la répartition géographique du Ver du Cayor. [**Geographical Distribution of Ver du Cayor.**]*—Bull Soc. Path. Exot.* 1933 Oct. 11 Vol. 26. No. 8. pp. 1098–1099.

A record of this wide spread "tumbu" fly from the forest region of Mayoumbe between Loango and Brazzaville; the larvae were found in labourers on the Congo-Ocean railway, whether *Cordylobia anthropophaga* or *rodhaini* is unknown The author says that the fly is now rare in Cayor, Senegambia, probably owing to deforestation. A. G. B

SASSUCHIN (D.). **Summary of Works on Tiek Investigations in the South-East of U.S.S.R.**—*Rev Microbiol., Epidémiol. et Parasit* 1933 Vol 12. No. 1 pp. 31–44 With 2 plates & 3 figs. [In Russian English summary pp. 45–46]

A description of the ticks found in the Lower Volga Region and Western Kazakstan, with an account of their bionomics, distribution, and rôle in the propagation of disease in man and domestic animals.

C. A. Hoare

- * KOPSTEIN (Felix) Die Gifttiere Javas und ihre Bedeutung für den Menschen [The Poisonous Animals of Java, and their Significance for Mankind].—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië*. 1932 Vol 21 No 4 pp 222-256 [Refs in footnotes]

Kopstein, in this article dealing with the poisonous arthropods, fish and snakes of Java, reports that bathers and fishermen are often stung by Medusae. Interesting cases are cited including that of a girl in Batavia, in whom local necrosis of the skin and tendons of the hand followed contact with a jelly fish, and another of a boy in the Philippines who died 3½ hours after being similarly stung.

Cantharidin poisoning by *Epicauta* beetles also occurs. One person, who ate ten roasted *Epicauta ruficeps*, died shortly after with severe gastro-intestinal symptoms including salivation, vomiting, diarrhoea and tenesmus. Dried beetles averaged 0.1 grams and contained about 10 per cent of cantharidin. VERBEEK observed that when *Epicauta ruficeps* was disturbed it discharged fluid which contained cantharidin from the mouth and joints of the legs. Skin contact produced blisters lasting 3 days. BRUG reported a fatal case after eating specimens of *Mylabris pustulata* (= *M. kolleri*), another beetle containing cantharidin.

Scorpions are also numerous, but though their sting causes much pain and swelling, no fatal results have been recorded.

Certain species of globe fish (Tetraodontidae), which are eaten only by poor people, are poisonous, but the flesh itself is harmless once the sexual organs (ovaries) have been removed.

Venomous fish mostly belong to the Siluridae and Acanthopterygii. *Synanceia verrucosa* is much dreaded: it lies concealed in sand and punctures the skin by means of rays on the dorsal fin. Gastro-intestinal symptoms, pain, swelling, lymphangitis and local gangrene ensue. Death with tetanic convulsions may occur, none have been recorded from the Dutch East Indies, but several non-fatal cases have occurred in Amboina and Ladrone. Of the Siluridae two species are well known. *Clarias batrachus* punctures with the first rays of the pectoral barbed fin which is connected with a poison gland; it produces local inflammation leading to necrosis or gangrene. *Plotosus caninus* possesses a poison spine on both the pectoral and dorsal fin and produces painful lesions, both these fish are commonly eaten in Java.

Kopstein's remarks on the poisonous Javanese snakes were reviewed in No. 2 of the Bulletin (p. 99).

N. Hamilton Fairley

- GIAMARCHI (P.) & SAUTET (J.). Contribution à l'étude des accidents dus à la piqure des araignées en Corse. [Symptoms of Spider Bite in Corsica].—*Rev. Méd. et Hyg. Trop.* 1933. Sept.-Oct. Vol. 25 No. 5. pp 257-260.

The venomous spiders of Corsica are *Latrodectus tredecimguttatus*, Rossi, two species of *Lycosia* and *Ctenizia savignyi* Rossi. *Latrodectus*, a black spider with bright red spots, is the most feared. Three cases are here described, one at some length. The symptoms are paralysis and violent pain in every case, profuse sweating very common, obstinate erection and anuria very common, late eruption common;

* Summarized from a translation by Colonel H. J. WALTON

the last consists of a general invasion of red lenticular spots, non-confluent and not disappearing on pressure. The treatment, described, is symptomatic. The peasants put the victim into a hot oven.

A G B

SERGEANT (Et) & SERGEANT (A). Pouvoir immunisant du venin d'abeille contre le venin de scorpion [Immunizing Power of Bee Venom against Scorpion Venom.]—*Arch Inst Pasteur d'Algérie*. 1933. Dec. Vol 11 No 4. pp. 588-597

The authors made numerous experiments to see whether the venom of Algerian bees (*Apis mellifica*) immunized mice and guinea-pigs against scorpion venom (*Buthus occitanus*)

They found that the stings of bees, or the subcutaneous injection of macerated stings, gave to 12 out of 20 mice a slight immunity to scorpion venom injected under the skin. In these instances death was delayed some hours or some days, 33 controls died in two hours. Bee venom did not protect 12 guinea-pigs against scorpion venom

A. G B

ACTON (H W). A Cause of Damage to Optical Glass in the Tropics—*Indian Med Gaz* 1933 Dec Vol 68 No 12 pp 688-689

BARRERA (Benjamin). Notes on Cirrhosis of the Liver among Filipinos—*Jl Philippine Islands Med Assoc* 1933 Dec Vol 13. No 12 pp 562-565.

BRUMPT (E). Paralysie ascendante mortelle expérimentale du chien par piqûre de la tique australienne: *Ixodes holocyclus*—*C R Acad Sci* 1933 Nov 27 Vol 197 No. 22 pp 1358-1361 With 2 figs

CLELAND (J Burton) & GRAY (J H). Pathological Lesions in Natives of Central Australia (Mt Liebig Area)—*Jl Trop Med & Hyg* 1934 Jan 1 Vol 37. No 1 pp 1-9 With 12 figs

FABRY. Asthème tropicale à manifestation hypotensive élective—*Ann. de Méd et de Pharm Colon* 1933 July-Aug-Sept Vol 31 No 3 pp. 364-371.

GAFFNEY (H J O'D Burke). Forefathers of Tropical Medicine—*East African Med Jl* 1933 July Vol 10. No 4 pp 100-114 [29 refs.]

VAN HASSELT (E H). Otitis externa in de tropenpractijk—*Nederl Tijdschr v Geneesk.* 1933. Nov 4 Vol. 77 No 44. pp 4959-4969

HUCHON. Note sur un traitement accessoire des rectites chroniques—*Ann. de Méd et de Pharm Colon.* 1933. July-Aug-Sept Vol 31 No. 3 pp 407-408.

VON IHERING (Rodolpho). Os peixes larvophagos utilizados no combate á febre amarella e á malária.—*Rev. Med-Cirurg do Brasil.* 1933 July-Aug. Vol. 41 No. 7-8 pp. 221-234

LEFÈVRE. La climatologie du Togo—*Ann de Méd et de Pharm. Colon.* 1933 July-Aug.-Sept Vol. 31 No 3 pp 388-395

LEFÈVRE. Les services d'hygiène au Togo.—*Ann. de Méd et de Pharm Colon* 1933. July-Aug.-Sept Vol 31 No 3 pp 396-406

LÉON (Rulx). Le service d'hygiène et d'assistance publique en Haïti.—*Bol Oficina Sanitaria Panamericana.* 1933 Nov Vol 12 No 11 pp 1097-1106.

Low (G. Carmichael). The Treatment of Tropical Intestinal Diseases—Reprinted from *Practitioner.* 1933 Aug. Vol 131 pp. 136-145

LULOFS (P. K. Drossaart). Een en ander uit de geschiedenis der kina—*Nederl. Tijdschr. v. Geneesk.* 1933. Sept. 2. Vol 77. No 35. pp. 3974-3985.

- MEDEDEELINGEN VAN DEN DIENST DER VOLKSGEZONDHEID IN NEDERLANDSCH-INDIË 1933 Vol 22 No 2 pp 61-121 With 3 figs on 1 plate & 1 text fig [23 refs]—Jaarverslag van het Geneeskundig Laboratorium over 1932
- PALÈS & POUDEROUX Les lésions anatomo-pathologiques de la pneumococcie en A E F d'après 85 autopsies—*Bull Soc Path Exot* 1933 Nov 8 Vol 26 No 9 pp 1182-1191, & 1934 Jan 10 Vol 27 No 1 pp 45-55.
- PENINGTON (Raymond G) Observations on Tumours in New Britain Natives—*Med Jt Australia* 1933 Sept 16 20th Year Vol 2 No 12 pp 374-379 With 7 figs
- POUSSON (Alf) Les grandes épidémies de Bordeaux Lèpre, peste, grippe, choléra—*Jl Méd de Bordeaux*. 1933 Sept 10 Vol 110 No 24 pp 635-643
- RADSMAN (W), STREEF (G M) & KLERKS (J V) Over het zuur-base evenwicht bij tropenbewoners (3e mededeeling)—*Geneesk Tijdschr v Nederl-Indie* 1933 Dec 5 Vol 73 No 25 pp 1591-1599 [14 refs]
- RADSMAN (W), STREEF (G M) & KLERKS (J V) Over het zuur-base evenwicht bij tropenbewoners (4de mededeeling)—*Geneesk Tijdschr v Nederl-Indie* 1933 Dec 19 Vol 73 No 26 pp 1651-1659
- SARNELLI (Tommaso) Notizie preliminari sui risultati della mia missione sanitaria nell' alto Yemen con particolare riguardo alla medicina indigena—*Arch Ital Sci Med Colon* 1934 Jan 1 Vol 15 No 1 pp 1-44 With 19 figs English summary (3 lines)
- SÉGUY (E) Moustiques urbains—*Ann d'Hyg Pub, Indust et Sociale* 1934. Feb Vol 12 No 2 pp 65-84
- SINCKE (G E) Ueber den Ursprungsort der Krankheiten von 1000 Kranken des Hamburger Tropeninstituts—*Muench Med. Woch* 1933 Oct 6 Vol 80 No 40 pp 1561-1562 With 1 fig
- TEDESCHI (Carlo) & TORTORANO (Luigi) Nosografia della regione di Buloburti e di El Bur (Somalia Italiana)—*Arch Ital Sci. Med. Colon* 1934 Feb. 1 Vol 15 No 2. pp 86-111 With 4 figs English summary (4 lines)
- VICK (Friedrich) Ueber die Auswertung von Temperatur- und Feuchtigkeitsmessungen und die Bedeutung der Schwülekurven—*Arch f Schiffs- u Trop.-Hyg* 1934 Feb. Vol 38 No 2 pp 80-85 With 2 figs
- WEISBERGER Note à propos d'un cas de remarquable tolérance du péritoine à l'infection, observée chez un indigène—*Bull Soc Path Exot.* 1933. Oct 11 Vol 26 No 8 pp 1117-1118
- WOKES (Frank) The Effect of Calcium Administration on the Toxicity of Carbon Tetrachloride in Mice.—*Quarterly Jl Pharm & Pharmacol.* 1933 July-Sept. Vol. 6 No. 3. pp 413-417. With 1 fig.
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REVIEWS AND NOTICES

CALKINS (Gary N.) [Ph D, Sc D, Professor of Protozoology, Columbia University] **The Biology of the Protozoa**. Second Edition, thoroughly revised.—pp. xi+607. With 223 engravings & 2 coloured plates. 1933. London. Baillière, Tindall & Cox: 8 Henrietta Street, Covent Garden, W C 1. [37s. 6d.]

The first edition of this book was published in 1926 and in it the author informed his readers that he had brought together conclusions founded on 30 years of research on the Protozoa and on an equal number of years of teaching protozoology at Columbia University and at the Marine Biological Laboratory at Woods Hole. Now, seven years later, he presents the second edition of this work which is, as he says, not a complete account of the Protozoa but rather a study in biology illustrated by unicellular animals. The author's researches during all these years have been concerned very largely with free-living protozoa and more particularly with the fundamental problems of organization, development and reproduction rather than with the details of structure and morphology which have made appeal to those more systematically inclined. His investigations on the phenomena accompanying fertilization and those on vitality in relation to youth, age and maturity, and the effects upon this vitality of conjugation and endomixis are well known. Protozoologists were grateful to the author for his first edition and they will be still further in his debt for the second, which introduces much new work and offers the reader, as no other book does, a clear account of what may perhaps best be described as the philosophical aspects of protozoology.

Though the sections of the book devoted to the foregoing subjects, upon which the author is a recognized authority, constitute its most interesting part, systematics are not entirely neglected, for at the end (in the earlier edition in the middle) are four chapters dealing with the special morphology and taxonomy of the four main subdivisions of the Protozoa, in which are included somewhat elaborate keys to the various genera. These keys will be of use, as they were in the first edition, to those who wish to determine the genus of any protozoon they happen to encounter. As already noted, the author's work has been chiefly with free-living protozoa and it is perhaps not surprising that when dealing with parasitic forms and the diseases they produce certain errors have crept in, especially in the chapter on ecology, commensalism and parasitism. It is not clear, for instance, what is meant by *Entamoeba intestinalis* (p. 51), *Lankesteria* is not a haemosporidian (p. 70); what is *Giardia angusta* (p. 115)? There is no such disease as infantile ulcer (p. 369), each sporoblast of coccidia of the genus *Isoospora* gives rise to 4, not 2, sporozoites (p. 405), Ross (1907) did not work in Paris (p. 407). *Plasmodium malariae* is not the largest of the malarial parasites of man (p. 408), the organism figured at B and C, Fig. 218 (p. 545) is certainly not *Lankesterella ranarum*, the statement that only in rare cases are organs apart from the digestive tract infected with the dysentery amoeba requires qualification by mention of the fairly common liver abscess (p. 396), *Entamoeba ratti* is surely not a parasite of the rabbit, nor is *E. cobayae* Walker (*E. caviae* Chatton) an amoeba of swine (p. 387).

Enough has perhaps been said to indicate the scope of the book, which will be very useful to those who wish to have a general survey of

the biology of the protozoa, but less so to those who wish to obtain detailed information regarding parasitic forms. On the whole the book will be of greater use to zoologists and biologists than to medical men

C. M. Wenyon.

LANGERON (M) **Précis de microscopie. Technique—Expérimentation—Diagnostic.** [Manual of Microscopy] 5th Edition. Entirely Revised—pp. xx+1205. With 365 text figs 1934. Paris Masson et Cie. 120 Boulevard Saint-Germain [100 fr.]

The third edition of this book, which appeared in 1921 and was reviewed in this *Bulletin*, Vol 19, p. 266, was followed in 1925 by the fourth edition and now this year by the fifth. This sequence of events speaks for itself and indicates a continuous demand and, what is more important, a recognition of its practical utility. What was said of the third edition in the review referred to above is equally applicable to the two succeeding editions. The book is unique and, coming from a laboratory where bacteriology, mycology, pathology and general parasitology are studied, and written by one who is himself not only a recognized authority on and teacher of these subjects but also an investigator in many branches of biology, it covers a very wide field in a way no other author has attempted. Broadly speaking it deals in a highly practical manner with many aspects of general microscopy, the methods of examination, fixation, embedding, cutting, staining and mounting of tissues and parasites, the technique of vital staining and observations on living organisms, and the special methods which have to be adopted for the study of protozoa, helminths, arthropods and fungi, including the procedures necessary for their cultivation and breeding. The invertebrate transmitters of vertebrate parasites are specially considered, the methods of maintaining them for experimental purposes being carefully described. As regards bacteria, these are dealt with only in so far as direct observation on infected material allows. The elaborate methods of culture employed in bacteriology are left for the books specially devoted to this subject.

Compared with the fourth edition the present one is longer by nearly two hundred pages. Many of the sections have been entirely rewritten and there has been introduced much new matter covering microspectroscopy, micromincination, microphotography by infra red rays, technique for examining objects by reflected light, vital staining and metallic impregnation of tissues, determination of pH by colorimetric methods and many other subjects not considered in the last edition. The illustrations are, as usual, excellent, while nearly fifty appear for the first time. Enough has perhaps been said to indicate the scope of this highly practical manual, which should find a place in every laboratory where parasitology is studied. Those who are familiar with BRUMPT's *Précis de Parasitologie* will perhaps realize that this *Précis de Microscopie*, coming from the same laboratory, is a sister book to it and embodies all the technical methods which are necessary for the study of the parasites Brumpt's book describes

C. M. Wenyon.

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THE SUBDISPENSARY SYSTEM IN UGANDA

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1 Introduction.

In native dependencies, the funds available for medical activities are usually inadequate to establish and maintain a service of qualified medical men in sufficient numbers to serve the general native population. Usually such service can only be made available for natives in the vicinity of headquarter stations and thus the rural population, representing about 95 per cent of the total, is excluded from its benefits. One of the principal objectives of a medical service in an African territory is to improve the hygienic standards of indigenous races, and this objective is clearly unattainable unless the organization includes adequate provision for the majority of the population, that is, the villagers. In townships, sanitary, administrative and municipal services exist, whereby the natives living therein can be forced to live up to a sanitary excellence foreign to them. In the villages there are no comparable services and it is necessary to introduce some factor here other than administrative pressure, in order that the aims of the medical department may be realized. In Uganda we have tried to secure the sympathetic co-operation of the native himself by means of the establishment of rural subdispensaries.

2. Historical.

A study of past Annual Reports invites the conclusion that in the period before the war the Medical Service was primarily concerned with the welfare of officials, their servants and employees, and with the rural population only when the safety of the European was threatened by the outbreak of epidemic disease. The sleeping sickness epidemic of 1901 and subsequent years directed the attention of the authorities to the necessity for closer medical control of the rural population, but little could be done owing to the inadequate numbers of European medical officers and Asiatic sub-assistant surgeons for the routine

duties required of them, and to the absence of trained African staff. In 1907, however, at the request of Sir H. Hesketh BELL, Colonel F. F. LAMBKIN, R.A.M.C., visited Uganda to report upon the prevalence of venereal disease and to suggest measures for its control. He recommended that a central venereal hospital should be established at Kampala and that treatment rooms under the charge of trained African attendants should be opened throughout the country so situated as to be within reasonable reach of all patients. This was the first proposal to train the African and to employ him in a responsible medical post. In 1908 SPARKES, TREVES and KEANE, all of the R.A.M.C., arrived to implement LAMBKIN's recommendations when a hospital of a temporary nature was built near Kampala and two treatment rooms, the prototypes and forerunners of subdispensaries but for the treatment of venereal diseases only, were opened at Mityana in 1909 and Masaka in 1910. KEANE opened each of these centres and as he was of necessity away from them a good deal, he trained his two interpreters to give injections and undertake the routine work during his absence. These were the first natives to undertake responsible medical work.

SPARKES and TREVES went home in 1910 and KEANE remained to carry on the work. He understood that there was no possibility of his colleagues being replaced by other medical officers and he therefore sought the sanction of the authorities to undertake the training of African staff, and for the official recognition of such training. The suggestion met with considerable opposition at first, but eventually sanction was obtained and by 1914 the organized training of Africans as medical attendants was being undertaken at the venereal diseases hospital at Mulago near Kampala. Upon the outbreak of war the venereal campaign and the subdispensaries came to an end, but the natives who had been trained at Mulago were enrolled in the Uganda Medical Corps established by KEANE at the beginning of the war, and formed the nucleus of the new organization as instructors. This body eventually became the African Native Medical Corps, with a strength of 1,000 and with total enlistments of 1,650, and the organized training of Africans in medical subjects was one of its most important undertakings. After the war the country did not settle down until 1921, when Mulago was re-opened as a venereal hospital and staffed with trained ex-A.N.M.C. attendants. Training was continued and extended and by the end of the year it was possible to open and staff five subdispensaries under Mulago. In 1923 Mulago became a general hospital and the subdispensaries followed suit and emerged as the general treatment centres which they are to-day. By this time the experiences of the war had revolutionized the outlook of the authorities with regard to the employment of trained African attendants, and particularly their use in extending the benefits of western medicine to the hitherto neglected rural populations. The policy was adopted and forwarded in every way by Dr. C. A. WIGGINS, then Director of Medical and Sanitary Services for the Protectorate, and the interest of the African in the movement was raised and maintained by the indefatigable efforts of Mr. J. C. R. STURROCK, at that time Provincial Commissioner of Buganda.

Subdispensaries became so popular that natives clamoured for them in every district, and by 1932 there were about 90 all over the country dealing with over 400,000 new cases and two million attendances annually. It seems probable that public demand will not be satisfied until there is a subdispensary at the headquarters of every district.

chief The popularity of dispensaries and of European methods of treatment is so marked to-day as to be accepted as part of the mental make-up of the African, but it must be remembered that this popularity was gained by hard work and a determination to assist them and gain their confidence. Our sheet-anchor in the early days was the exhibition of really effective treatment with the highest possible result in cured cases, dramatic cures being aimed at whenever circumstances permitted.

3 *General Description and Aims of the System*

A subdispensary is a fixed unit conveniently situated amongst a rural population, in the charge of a trained native attendant and supervised at regular intervals by a medical officer. Its primary aim is to establish itself amongst the people as a popular institution and to do so its first function must be the relief of disability. When confidence has once been gained in this way the African can readily be persuaded to submit to curative measures that he would not otherwise accept, operative interference for example, or protracted treatment of a disease such as syphilis after signs and symptoms have disappeared. Later he will submit, at his own subdispensary, to preventive measures such as vaccination or inoculation even though they impose some disability and, as far as he can see, do no conceivable good. He will report events which he has been told are of importance, such as the death of rats or the prevalence of an infectious disease. By example and persuasion he can be led to improve the hygienic standards of his dwelling and its surroundings. Maternity and child welfare work can be established with ease at a centre already popular and highly regarded on account of the obvious benefits received from it. Thus, a subdispensary which was established for the routine treatment of minor ailments can, later on, establish itself as a vital health centre amongst the population which it serves, embodying in its activities three of the main divisions of medical science, the curative, the preventive and the statistical. It would be wrong, however, to assume that the subdispensaries of Uganda are performing all these functions. None have yet reached the final stage, many have not passed the first stage of being only curative centres, but every year some take on preventive duties and a few are definitely established as rural health centres.

4. *The Financial Aspect of the System and its Relation to the Provincial Administration.*

A subdispensary undertaking should be as much an administrative as a medical scheme, and the co-operation of district officers is essential. The District Officer is the head to whom his people look for advice and direction. He, or his assistants, are continually on tour in their district and are in closest touch with popular thought. Their powers of persuasion are great, and the disposal of funds and of labour is in their hands. The District Officer should regard subdispensaries in his district as part of the machinery of successful administration. If the natives and both administrative and medical officers can be induced to want subdispensaries, it is surprising how easy it is to establish the system and at what little cost. It has been the policy of the Uganda government to throw responsibility for the cost of their erection and maintenance as far as possible upon the shoulders of the administrations concerned. Each district has at its disposal a public fund derived from a proportion of the taxes collected, known as the Native Administration Fund. This money is controlled by the local

native council, advised by the administrative officers and a yearly estimate is submitted for the approval of government of the way it is proposed to use the fund. Provision is made from these funds for the costs of erection and maintenance of subdispensaries. Naturally the wealth of districts varies and in those districts that can afford it the whole cost of erection is met from these funds, the choice of type of building being left very much to the discretion of the local authorities. Within the last few years the richest districts in the Eastern Province have built complete hospital units in permanent material at a cost of £4,500 a unit. The advantage of such large units is however not yet certain. In less rich districts, a suitable dispensary building and out-houses in permanent or semi-permanent material can be built for £300 if free labour is available, whilst in the poorest districts, where labour only can be contributed, the cost of providing cement floors, windows and doors for a building in temporary material, i.e., mud and wattle walls and a thatch-roof, should usually not exceed £100. In these cases this sum must, of necessity, be provided from Protectorate funds. The cost of the initial equipment of a subdispensary varies with the type of unit and is usually shared by native administrations and government according to circumstances. The average annual cost of maintenance is about £300 to £400 under the following heads, overhead charges being excluded:—

	£	to	£
Personal emoluments—Native Staff ...	55		80
Car allowances to supervising medical officers ...	40		60
Drugs, dressings and equipment ...	205		260
	<hr/>		<hr/>
	£300		£400
	<hr/>		<hr/>

The cost of recurrent charges is borne from native administration funds in the case of districts which can afford it, and by government in districts which cannot, in other cases a proportion of the cost may be contributed by native administrations.

5. *Buildings and their Siting*

Subdispensary buildings vary in Uganda from a mud and wattle thatched roof two-roomed dispensary building with a cow-dung floor, to a unit in concrete blocks with corrugated iron roof and cement floor throughout comprising buildings which go to make up a complete hospital. The essentials of a subdispensary are an adequate dispensary building and quarters for staff. The nature of the building is almost of minor importance, although it is always desirable to have it in permanent material if possible, but it will be found that each district will provide what it can afford. The plot on which the subdispensary is built should be about 5 acres, because it will be found that whether in-patient accommodation is provided or not, there will always be plenty of in-patients for whom, in the absence of better accommodation, their friends will build little temporary huts in the immediate vicinity. Although they rely for their main attendances upon the surrounding population, these subdispensaries attract the sick from 20 to 30 miles away, and some accommodation must be found for these strangers.

The majority of patients, however, are drawn from an area enclosed within a radius of from 5 to 10 miles of the subdispensary, those living nearest attending the most frequently. It is usually desirable to site the unit in a country where the concentration of population does not

fall below 60 to 70 per square mile over the whole area, thus serving from 5 to 20 thousand people. If it is assumed that the concentration of population is constant at 60 per square mile over the whole area, it may be expected that the 5,000 inhabitants of the 5-mile circle will provide over half the attendances, the 15,000 living in the 5-mile belt surrounding this circle a third, the remainder being accounted for by those living further afield and travellers, but these figures vary widely according to circumstances. Nevertheless, a population of 3,000 in the immediate vicinity will often justify the erection of a subdispensary, even if the surrounding country is but sparsely inhabited. The concentration of population is usually highest at the administrative headquarters of a chief and it is always desirable to site subdispensaries there, where they form one unit with the local council house and the gaol, moreover, it is here that district officers attend regularly for routine administrative duties, and thus additional supervision is gained, and the subdispensary has little chance of being neglected. Another advantage of this siting is that the chief can give direct supervision to the subdispensary staff and he usually develops a pride in a unit which forms part of his own headquarters, and will see that it becomes in no way inferior to the subdispensaries at the headquarters of his fellow chiefs.

Accessibility too is essential, as the regular supervision by medical officers is a necessary feature of the scheme. The building should thus be sited on a motor road and should usually be not more than 50 miles from the station of the visiting medical officer.

6. Staff

The native staff of a subdispensary usually consists of a charge attendant, one or more junior attendants and, when possible, an African nurse. As the subdispensary takes up its extended duties as a health centre this staff will be increased perhaps by a native midwife and attendants trained in preventive work. The charge attendant and his staff should be of the tribe of the people amongst whom they are working. This though not always possible is always desirable. The attendant must be of good character, sympathetic, intelligent, and capable of assuming responsibility. A knowledge of English is desirable since he will be required to keep case sheets of the patients who come to him for relief. He must be capable of recognizing such diseases as yaws, syphilis, leprosy, sleeping sickness, etc., of recording what he has recognized and of treating the conditions appropriately by intravenous and intramuscular injection. He must be competent to undertake the local treatment of injuries, ulcers, abscesses and similar conditions. He should be able to treat minor ailments, such as malaria, cough, indigestion or constipation, by stock medicines, and be able to recognize by the use of pulse, temperature and general observation, a condition as being serious, and to take measures to ensure that such a case is seen soon by a doctor.

To attain such a standard a course of training of about three years is necessary, and it may be expected that only about one, or perhaps a little more, in every ten of the candidates selected and accepted for training will succeed in becoming efficient charge attendants. This type of training may be undertaken either at a central hospital or sometimes quite successfully by an enthusiastic district Medical Officer. In Uganda assistants designated Senior African Medical Assistants are being trained up to a standard rather in advance of that of the Asiatic

sub-assistant surgeon and almost comparable to that of a qualified medical man. Such assistants, who are licensed to practise under the local Medical Registration Ordinance, can, of course, only be trained in a medical school based upon a central and fully equipped training hospital.* Some of these assistants have been placed in charge of the larger subdispensaries but it is still an open question whether they will find their greatest sphere of usefulness in this capacity. Their training represents the latest advance in the progress of medical training recorded in the historical part of this paper. The subdispensary system was established long before the idea of setting up a medical school was received, and such highly trained assistants are in no way essential to the success of such a scheme, although the subdispensaries may form a useful complement to the school in affording additional training ground.

Before leaving the question of staff further reference must be made to the nurse mentioned above. The training of female attendants has been found to be unsatisfactory, partly because the women do not appear to have the same capacity for education as the men, and partly because it is at present almost impossible to attract the right type of girl for the work. Nevertheless, it is certain that in time, as in more civilized countries, the nursing of the sick in Africa must become woman's work, and so it seems desirable to continue with the effort however disappointing the results may be. Another important reason for the employment of women attendants is that the native woman, clothed or unclothed, is essentially modest and resents intimate examination or handling by the other sex to the point of refusing treatment, though she will accept such treatment from her own sex. Women are the essential people to attract to a subdispensary because through the women we get the children, and it has been considered desirable, therefore, to give the opportunity of perhaps inefficient treatment at the hands of our native nurses, rather than no treatment at all. Finally, this practice removes the male attendant from a situation fraught with temptation.

7 *Establishing and Maintaining a Subdispensary.*

The decision to erect a subdispensary in a district is usually arrived at by discussion between the District Officer, the Medical Officer and the Chiefs of the district concerned. The Medical Officer informs the head of his department of the proposal, whilst the District Officer refers the matter to his Provincial Commissioner with an estimate of the money and labour he can contribute towards the project. The proposal is sent to the headquarters' medical office, and if the approval of government is obtained, provision is made in estimates for any charges to be met from government funds. Plans are provided or approved by medical headquarters and the actual building is undertaken by the District Officer, by contract or otherwise. When the unit is built, staffed, equipped and opened it is advisable that preliminary propaganda should be undertaken at the local councils by district officers when on tour.

Patients are seen by the charge attendant. If the disability is serious, or treatment likely to be protracted, details are filled in on case cards which are retained at the dispensary to form a card index system, the patient retaining a slip with the appropriate card number only. On account of expense case cards are dispensed with for minor com-

* See this *Bulletin*, Vol. 30, pp. 659-668.

plants and the slip retained by the patient is the only record of treatment. In all other cases there is a complete permanent record of the case which is available even if the patient transfers to another unit for subsequent treatment. Patients are encouraged to pay something for their treatment even if it is only a few cents, and money so collected is recorded on the case sheets and slips and is eventually credited to Protectorate revenue, though native administrations have repeatedly represented that such contributions would be more equitably credited to native administration funds. Although payment is encouraged treatment should never be refused on account of inability to pay, and it is advisable to give it free in all cases of infectious disease where the disability is of as much importance to the community as to the individual, particularly in the case of women and children. The whole question of payment is a difficult one and must be governed by the circumstances of each case.

The important day at a subdispensary is that of the medical officer's visit, which should be weekly. An occasional surprise visit is desirable but otherwise the doctor's visiting day should be a regular one, known to every one concerned so that those patients wishing to do so can be certain of seeing him. He travels by car, for which he receives a mileage allowance, bringing with him the weekly supply of drugs, dressings, and any patients who have been taken to his headquarters' hospital for treatment and have now recovered. He takes back with him patients who cannot be satisfactorily treated at the subdispensary for admission to his hospital.

The Medical Officer should take the clinic himself on his visit, and should see new cases which have attended since his last visit, as well as the more serious old cases set aside for him by the charge attendant. His other duties include a scrutiny of case sheets, accountancy and receipt of payments made, and it may be desirable to restrict the administration of expensive drugs such as salvarsan to the one day of his visit. At many of the subdispensaries the attendants visit outlying parts of their districts in a preventive capacity daily, and in these cases the medical officer will receive the reports of the inspectors with regard to vaccination and inoculations performed, rat mortality, general sanitary conditions and other matters of public health interest. His duties must vary in accordance with the stage of development of the subdispensary, but through his subdispensaries a district officer can, in time, obtain a complete knowledge of the sanitary conditions of every village in his district, and of the physical condition of their inhabitants.

8. *Conclusion.*

I have touched upon the origin of the subdispensary system and tried to show how it is the instrument by means of which preventive measures can be imposed upon rural populations and how also it is the connecting link between the medical and administrative services. But it stands for more than this. Much has been said recently in favour of indirect rule in Africa, a form of government originally involved in Nigeria and Uganda. The subdispensary system is perhaps the most important practical application of this form of government in which, under the guidance of the European, the native himself applies with his own capital and labour a scheme for his own betterment. The policy is one which many governments can afford to adopt, but few to ignore.

HELMINTHIASIS.

LEIPER (R. T.) **Helminthology : a Chapter in Comparative Medicine.**
—*Proc Roy Soc Med* 1933. Dec. Vol 27 No 2 pp 127-134 (Sect. of Comp Med pp 1-8)

The Presidential Address of the Section of Comparative Medicine of the Royal Society of Medicine deals successively with general remarks, "normal parasitism" and "pathological parasitism."

After intimate remarks on the affairs of the Section (such as that it should not, as at present, consist almost entirely of medical men and veterinary surgeons, but should embrace eminent biologists, biochemists and comparative physiologists) a survey is given of helminthological posts and literature. The value of comparative zoology is illustrated by the effect which the knowledge of the development of *Cucullianus elegans*, obtained by LEUCKART, had in his urging FEDSCHENKO to investigate on similar lines the life history of the embryo of the guinea-worm, since the two larvae were identical in structure, the correlation by STEENSTRUP of the already well-known rediae and cercariae as parts of the life history of trematodes, and LEIPER's use of apharyngeal cercariae in directing him to elucidation of the life history of schistosomes. Biological races are discussed—of *Ascaris lumbricoides* in man and pig, of *Ancylostoma caninum* and *Dipylidium caninum* in cat and dog, and of *Heterodera schachtii* in various plants.

"Normal parasitism" is described as follows —

"In many forms of animal life we find that hosts and parasites live together in harmony and that there is a normal biological equilibrium subsisting between them, the host harbouring a small number of parasites and suffering no ill-effects from their presence. To this condition of peace and amity the host may even make a special contribution, for it has lately been shown that the presence of a small number of helminths may stimulate a physiological response on the part of the host tissues, of a potency just sufficient to prevent the establishment of additional parasites of the same species."

With its description are associated age immunity, acquired immunity, and biological checks, instances being given of all, the last dealing with the manner in which helminth eggs and larvae are destroyed in vast numbers by other organisms.

"Pathological parasitism" is held to be that in which physical injury or excessive parasitism causes damage to the host. The statement "Helminth parasites, as is well known, do not give rise to successive generations within the same host" evidently implies disbelief in the "hyperinfective" strongyloides strains of FAUST, or the definition as ectoparasites of the intestinal larvae which cause them (as well as of all adult worms in the intestinal canal and its adnexa including the pulmonary passages) which though strictly defensible will be apt to confuse. The effect, in producing excessive parasitism, of even such a temporary domicile as a nest is mentioned; and in considering the spread of infection stress is laid on the effects of domicile imposed by man on himself and his domestic animals, and of the change in Egypt from basin to perennial irrigation which raised human bilharzias infection from 10 to 90 per cent. by its huge increase in the molluscan population. The scope of diet and intercurrent infection in changing "normal" to a "pathological" parasitism is mentioned, as are the mechanical effects produced by parasites both in their normal migrations and when strayed.

"Much remains to be accomplished in the realms of both normal and pathological parasitism, but there has now been accumulated a very considerable body of exact helminthological data which ought to be applied in the field. This transition from the laboratory to the field is always a difficult step, and the student of applied helminthology must not leave entirely to others the practical application of his work until he feels assured that his results are being really effectively used"

Clayton Lane

FREUND (L.) Helminthenwanderungen I Teil. Die Wanderungen und die "Passagen" der Nematoden im Wirtskörper. II. Teil. Die Wanderungen der Trematoden im Wirtskörper und vom Wirt zum Wirt [*Helminth Wanderings.*].—*Ztschr f Parasitenk* 1933. Nov. 23 Vol 6 No 2 pp 243-268. With 4 figs [28 refs]

A dissertation on the wanderings of helminths within and between their hosts.

I Regarding nematodes it is concluded that their larvae bore through the intestinal wall into the vascular system as the result of the necessity that they should be nourished by blood proteins [though their boring into, for example, pith, is one of the classical instances of this instinct]. They are transported mechanically in the vascular system and break out of this under the influence of taxis of special organs [*cf* ASHFORD, PAYNE and PAYNE, p. 391 with their suggested implication of massive larval straying]. This breaking out carries them to the outer world or to organs that communicate with it, thus permitting of perpetuating the species. Special cases are considered and there is restatement of the conclusion that entry into and transportation by a vascular system is a primitive feature and is still retained by most nematodes, and is not to be considered as a wandering but as a passage.

II The wanderings of trematodes are reviewed

C L.

YENIKOMSHIAN (H. A.) & BERBERIAN (D. A.) **The Occurrence and Distribution of Human Helminthiasis in Syria and the Lebanon, with Case Reports of *Dicrocoelium dendriticum* and *Hymenolepis nana* Infestations.**—*Trans. Roy Soc Trop Med. & Hyg.* 1934. Jan. 31 Vol 27 No 4 pp 425-435 With 1 plate.

An account of helminth infections in Syria and Lebanon

"1. 3,530 stool specimens were examined for ova of helminths, of which 70 per cent. were positive, 11 per cent. showed multiple infestation. Helminthiasis is more frequent in Syria than in the Lebanon.

"2. The rate of infestation with *Ascaris*, *Trichuris*, *Ancylostoma* and *Taenia* varies in different parts of the country. In the northern section and also in the interior of the country ascariasis and trichuriasis are very common. In the coastal zone amongst the workers on banana and orange plantations and gardeners of Hamah and Homs, on the banks of the Orontes and Euphrates, ancylostomiasis is very common, while ascariasis is comparatively rare.

"3. In Beirût and its surroundings *T. saginata* infestation is more common than elsewhere.

"4. 117 cases of *E. vermicularis*, 25 cases of *Trichostrongylus* sp. and 7 cases of *S. stercoralis* infestation are recorded.

"5. 51 cases of *H. nana* infestation are recorded. In many of these signs of irritation of the nervous system were noticed. Some of these cases were clinically cured after the expulsion of the worms

"6. 18 cases of *D. dendriticum* and 7 cases of *F. hepatica* are recorded. Presence of ova of these flukes in the stools may very well be accidental, due to ingestion of infested liver. Two of the cases of *D. dendriticum* appeared to be true instances of parasitism." C L

CIUREA (I.). Les vers parasites de l'homme, des mammifères et des oiseaux provenant des poissons du Danube et de la Mer Noire. Premier mémoire Trématodes, famille *Heterophyidae* Odhner, avec un essai de classification des trématodes de la superfamille *Heterophyoidea* Faust. [Parasitic Worms of Man, Mammals and Birds from Fish of the Danube, Black Sea, Bessarabia, Dniester.]—*Arch. Roumaines Path. Expér. et Microbiol.* 1933. Mar.-June. Vol. 6 Nos. 1-2 pp 1-134. With 95 figs on 36 plates. [5 pages of refs.]

—. Sur quelques larves des vers parasites de l'homme, des mammifères et des oiseaux ichtyophages, trouvés chez les poissons des grands lacs de la Bessarabie, du Dniester et de son liman—*Ibid.* pp 151-170 With 22 figs. on 13 plates

These beautifully and profusely illustrated memoirs deal closely with the systematic position, anatomy and life history of the parasites indicated in the titles C L

V. BRAND (T.), HOLTZ (F) & VOGEL (H.) Experimentelle Verkalkung unter dem Einfluss des Calcinossefaktors bei Befall mit tierischen Parasiten. [Experimental Calcification round Animal Parasites induced by "Calcinossefaktor."]—*Ztschr. f. Parasitenk.* 1933. Dec. 18. Vol. 6 No 3. pp 308-322 With 7 figs. [11 refs]

Calcification in the tissues round embedded parasites was obtained experimentally by large doses of "calcinossefaktor," an irradiated ergosterin

In trichinae, calcification appeared in 2 to 3 months, that is, at a shorter interval than it does naturally. Calcification of *Cysticercus pisiformis* occurred in necrotic liver tissue and was perhaps "unspecific." It was also noted in the case of *C. fasciolaris*, *Eimeria stiedae* and schistosome eggs, but only in the last was there lime deposit within the parasites themselves. C. L.

MAPLESTONE (P. A.) & CHOPRA (R. N.). The Toxicity of Tetrachlorethylene to Cats.—*Indian Med. Gaz* 1933 Oct. Vol. 68. No 10. pp. 554-556.

Tetrachlorethylene is much less toxic to cats than is carbon tetrachloride; in therapeutic doses it does not damage organs nor is its toxicity increased by alcohol.

Symptoms appeared (giddiness, drowsiness, restlessness, and some unsteadiness in the hind limbs) only when a dose of 1 cc. per kilo was reached. After 4.5 cc. per kilo all cats recovered, after 5 cc. all died. Doses of 2 to 3 cc. per kilo in 95 per cent. alcohol gave rise to no greater intoxication than did the plain drug. Cats which died had the following lesions—Liver: congestion, fine fatty change, and in one case a little necrosis. Kidneys: in glomeruli congestion, albuminous exudation after higher doses; in tubes, granular and fatty change proportionate

to the dose ; so that " 0.5 ccm. per kilogramme of this drug [carbon tetrachloride] causes incomparably greater damage than does 5 ccm. per kilogramme of tetrachlorethylene." C. L.

MAPLESTONE (P. A.) & CHOPRA (R. N.) **The Effect of Hexylresorcinol on Cats.**—*Indian Jl Med Res* 1934. Jan. Vol. 21. No 3. pp 519-521.

Unless there is care in selecting patients, accidents are liable to occur after treatment with hexylresorcinol

Experiments were carried out on cats, in 12 the drug was dissolved in alcohol, and in 12 in olive oil. With alcoholic solution symptoms appeared when doses were of 1.6 to 3 grains per kilo, namely drowsiness and unsteadiness of the hind limbs with recovery within 24 hours, when they were of 4 to 5 grains per kilo all cats died. In olive oil toxicity was less severe. As to lesions, which are reported by M. N. DE, doses of 1 grain per kilo did no apparent damage. With $2\frac{1}{2}$ to 5 grains per kilo, there was gastric necrosis, which might extend in the larger doses through half the depth of the mucosa with congestion and occasional haemorrhage and leucocytic infiltration. As to the duodenum, $2\frac{1}{2}$ grains produced hypersecretion, 5 grains per kilo some congestion. In the liver there was in all but one case moderate congestion with slight cellular damage. In the kidneys moderate congestion with slight granular and fatty change in large doses. They add the following report on man :—

" Since the paper by Maplestone and Mukerji (1932) appeared we tried this drug, incidentally without any anthelmintic effect, on a patient with strongyloides infection accompanied by a certain amount of ' indigestion ' The patient although not in any sense endangered from the point of view of loss of life suffered considerable pain and exacerbation of his digestive disturbance, with consequent loss of appetite for some days after his treatment with hexylresorcinol. Apparently the drug considerably increased the already present irritation of the gastric and duodenal mucosa "

C. L.

CHRISTENSEN (B. V.) & LYNCH (H. J.). **The Effect of Anthelmintics on the Host. I. Tetrachlorethylene. II. Hexylresorcinol.**—*Jl. Pharm. & Experim Therap.* 1933 Vol. 48. pp 311-316. [12 refs.]

In experimental dogs pathological changes were greater after tetrachlorethylene than after hexylresorcinol.

The experimental procedure was the same in both sets of tests. When using single doses the animals were starved for 24 hours, dosed according to weight, and killed and examined 24 hours later. Multiple doses were repeated fortnightly.

Tetrachlorethylene.—Dosage in cubic centimetres and weight of dogs in kilos were as follows :—1 ; 4.8 : 2 ; 9.7 : 3, 12.2, 12.5, 15.9. It was given in soft gelatin capsules in the morning and followed in 4 hours by magnesium sulphate. After a single dose there was considerable depression of heart and respiration, more noticeable after the purge was given. The liver showed mild, and the heart some diffuse, fatty degeneration ; the kidneys appeared undamaged, the small intestine was invariably extremely shrivelled and spongy and showed very marked inflammation. With repeated doses one dog of 7.7 kilos, given doses of 2 cc., died after the ninth dose ; the second of 14.1 kilos,

getting doses of 3 cc, was killed after the fifth, changes in heart and liver showed the same picture more pronouncedly, damage increasing with the number of doses, the kidneys were unchanged

Hexylresorcinol—Dosage in grams and weight of dogs in kilos were as follows 0.6, 4.2 and 4.3 · 0.8, 6.9 and 9.1 1.0, 11.2 The crystalline drug was given in hard gelatine capsules, with purge as above noted. After a single dose there were no apparent symptoms and no macroscopic changes were visible, microscopically liver and heart "showed only very slight damage", the kidneys none. After repeated doses, liver and heart though macroscopically normal showed "a very pronounced degree of damage", one of these dogs died 4 days after the 5th dose, the other became sick after the 3rd and was killed after the 4th dose; in both there was inflammation, necrosis and softening of the small intestine, in both the kidneys appeared undamaged.

C L

GOPSILL (W. L.) **Rotylon as an Anthelmintic.**—*South African Med J.* 1934 Jan. 27 Vol 8. No. 2. pp 43-45

The author's conclusions are that 3 capsules of rotylon caused the passage of a stray ascaris, 6 capsules caused hookworms to be expelled, 8 caused them to be eradicated

In all, 17 cases were treated "Rotylon is an aromatic combination insoluble in water, but soluble in alkalis" The liquid produces burning and prolonged anaesthesia of the tongue, each gelatine capsule contained 0.4 gm. D.C.F was used (presumably in all cases) for diagnosis Symptoms were colic followed and relieved by passage of a stool A dose of 3 capsules to each of ten men was ineffective, one of 6 capsules was followed in one case by stools without ova [which had presumably been present before] Six capsules were given to each of four adults "heavily infected with hookworm"; one passed 16 worms and became negative for eggs on the fifth day, the second passed 10 worms and later showed no eggs, the third passed no worms, nor did the fourth although eggs ceased to be found. One had 8 capsules and passed 36 hookworms and 1 ascaris, with disappearance of ova. One had 13 capsules and passed no worms The last had 13 capsules and passed no worms though presumably eggs had previously been found. The consistent use of "ovae" as the plural of ovum is unexpected.

C L.

LIÈVRE (H). Résistance de la grande douve du foie à quelques toxiques. [**Resistance of the Liver Fluke to Poisons.**]—*C R Soc. Biol.* 1934. Vol. 115. No. 6 pp. 635-636.

The drugs were applied *in vitro* in a 1 per cent. concentration, being added to bile or to Ringer's solution with glucose and kept at 37°C. Survival of the *F. hepatica* was as follows In hours—stovarsol 5, emetine 4, tartar emetic or methylene blue 2½, methylene blue 1½, extract of male fern 1½. In minutes, quinine 50, gentian violet 40, pelletierine 15, thymol 1½. In less concentration results were poor, and it is noted that the concentration in the body must be much less. [To accept the relative figures for medical practice implies the belief that it is the chemical substance which is swallowed that acts as an anthelmintic.]

C. L.

TAYLOR (E. L.) **The Production of Malformed Eggs by Immature *Fasciola hepatica***—*Trans Roy Soc Trop. Med & Hyg* 1934 Mar 12. Vol. 27. No 5 pp 499–504 With 3 figs.

The point of medical interest in this paper lies in this and other instances where malformed eggs have been found in young flukes, a matter which may prove to have a value in indicating that infection is recent
C. L.

HOUEMER (E.). Au sujet d'une coutume favorisant l'infestation des Indochinois par *Clonorchis sinensis* (Cobbold, 1872). [**A Custom favouring Infestation of Indochinese by *Cl. sinensis***.]—*Bull Soc. Path. Exot* 1934 Jan 10 Vol 27 No 1 pp 21–23

An entertaining paper describing methods of preparing and eating raw fish, locally esteemed a delicacy

Clonorchis infection is locally present in 1·4 to 40 per cent of human beings, in 10·94 per cent of dogs and 32·83 per cent of cats. Fish is eaten raw. The larger kinds are scaled, cleaned, filleted, cut into pieces 1 to 4 cm long, carefully dried between two bits of paper, dipped in an acid, salt, or sugary sauce, sprinkled with rice or grated sesame, mixed with powdered ginger, wrapped in some aromatic leaf and so eaten. The small *Carassius auratus*, however, swims about in a bowl beside the feaster who when disposed fishes for it with a landing net or scoop, seasons it in the method he prefers, and eats it still wriggling. For public education, as a preventative, public places and schools should, it is suggested, be placarded with humorous posters
C. L.

VAN HOOF (L.) Un cas de distomatose pulmonaire au Congo Belge. [**Case of Paragonimus Infection in Belgian Congo**.]—*Ann Soc. Belge de Méd. Trop* 1933 Dec. 31 Vol 13 No. 4. pp. 473–478 With 3 figs

A case of paragonimus infection in one who had never left the Belgian Congo, evidenced by clinical, laboratory and X-ray findings

A native man with vague pains in the right side of the thorax contracted sleeping sickness in the Lower Congo, was treated with tryparsamide, developed haemoptysis, and at Leopoldville no tubercle bacilli but trematode eggs were found in the sputum. They averaged 87·1 μ by 52·5 μ with minima of 77 μ by 42 μ and maxima of 100 μ by 60 μ . They were brownish, operculated, thickened at the lower pole, in fact corresponded to paragonimus eggs, and are pictured. Reference is made to LIBERT's case in the Cameroons [this *Bulletin*, Vol 29, p. 412.]
C. L.

RODHAIN (J.) & VAN HOOF (M. T.). Essais de chimiothérapie antihelminthique. [**Anthelmintic Chemotherapy**.]—*C. R Soc Biol.* 1934. Vol. 115. No 2 pp. 192–194.

The lung fluke of the frog *Distomum cylindraceum* Zinder, was treated with a view to a lead towards the treatment of paragonimus in man.

Even when the doses sufficed to kill the host they left the flukes alive. The drugs tested were potassium tartrate, emetine, Dn 7, foudanin, carbon tetrachloride and tetrachlorethylene, orally, hypodermically or intraperitoneally.
C. L.

TUBANGUI (Marcos A.) & PASCO (Antonio M.). **The Life History of the Human Intestinal Fluke, *Euparyphium ilocanum* (Garrison, 1908).**—*Philippine Jl Sci* 1933 Aug Vol 51 No. 4. pp 581-606 With 4 plates & 1 fig [18 refs]

The life history of this fluke is as follows.—

The miracidium, freed from the evacuated egg after development at room temperature for 9 to 20 days or more, enters the first intermediate host, *Gyraulus prashadi* Faustino, a small fresh-water planorbid. From it the cercaria escapes after 42 to 50 days and enters another snail, apparently any of the Philippine fresh-water snails, including the primary intermediate host. Of these *Pila luzonica* is that most commonly eaten by man, and is therefore probably the most important hygienically. Experimentally the metacercaria which develops in the secondary intermediate host has been successfully fed to clean laboratory white rats, a cat and 2 monkeys, and unsuccessfully to young pigeons and a pup. The cercaria, metacercaria and adult have 51 collar spines in 2 alternating rows uninterrupted dorsally. Prevention consists in proper faecal disposal and avoidance of eating imperfectly cooked snails. C. L.

RAO (M. Anant Narayan). **A Preliminary Report on the Adult Trematode obtained from *Cercariae indicæ* XXIII Sewell, 1922.**—*Indian Jl Vet Sci & Animal Husbandry*. 1933. Dec. Vol. 3. Pt. 4. pp 317-320 With 4 figs on 1 plate & 1 text fig

Except in size (it measures 2 to 4.5 mm. by 0.75 to 1.2 mm.) the adult form seems to tally with *Euparyphium malayanum* Leiper, 1911.

The cercariae were present in 42.8 per cent. of 1883 *Limnea leuteola*, metacercariae in wild *Planorbis exustus*, *Limnea leuteola* and on the gills of *Barbus stigma*. The last forms were fed to the dog and adults were recovered from its intestine. The investigation started because Rao had found these flukes in 1931 in the intestine of a dog. C. L.

RAMSAY (G. W. St. C.). **Routine Examination of the Urine in Areas in which *S. haematobium* is Endemic: a Consideration of the Significance of Certain Abnormal Constituents.**—*West African Med. Jl* 1932. July. Vol. 6. No. 1. pp. 3-4.

It is concluded that a routine examination of the urine can be carried out so as to display all cases infected with *S. haematobium*.

The examination consisted in standing urine for 5 minutes and then centrifuging the bottom 7 cc. for 3 minutes at 1,500 revolutions a minute. There were examined 2,174 males of which 33.9 per cent. showed ova. Of these 737 cases, 689 showed erythrocytes, while these were present in 338 of 1,437 who showed no ova. It is felt that this statement does not make the matter clear enough and that it is necessary to call in the following equation to show that the coefficient of association is high, namely 0.93, and that the presence of blood is a fair index of infection.

$$C = \frac{(AB)(ab) - (Ab)(aB)}{(AB)(ab) + (Ab)(aB)}$$

where A=ova present, B=blood present, a=ova absent, b=blood absent, and C the coefficient.

C. L.

DIXON (Patrick K.). **Age Incidence of Schistosome Infection : and Species of Malaria Parasite in Katanga.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934 Mar. 12. Vol. 27. No. 5. pp. 505-506

Schistosomiasis—Of 1,343 urinary examinations eggs of *S. haematobium* were found in 8.6 per cent. (no schistosome eggs were found in about the same number of faecal examinations). Incidence was highest between 10 and 15 years, no infections being found after 45. It is therefore believed that immunity is acquired fairly rapidly.

Malaria—Since examination was made by native orderlies no diagnosis of *P. vivax* was accepted unless gametocytes or rosettes were found and no mixed diagnosis unless crescents were present in addition. Diagnosis was thus weighted against *P. vivax*; but even so, in 1,413 cases *P. vivax* was found alone in 13.6 per cent and in conjunction with *P. falciparum* in 3.7 per cent. In Elisabethville, 150 miles off, WALRAVENS found less than 3 per cent. of *P. vivax* infection, a figure confirmed by other workers in that town. Clinically the two infections were similar. To plasmodin the gametocytes of *P. vivax* disappeared more rapidly than those of *P. falciparum*. C. L.

HASHIM (M.). **Pathological Lesions of the Gall-Bladder associated with Ulcerations and Bilharziasis of the Intestine.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934. Jan. 31. Vol. 27. No. 4. pp. 399-407. [11 refs]

A histological demonstration of schistosomiasis and amoebiasis in the gall bladder itself.

Of 280 autopsies 82 showed obvious intestinal lesions, 43 being bilharzial, and in six of the latter schistosomiasis of the gall bladder occurred. Ova identified as those of *S. mansoni* were found in all six, of *S. haematobium* in two. This is believed to be the first time such ova have been reported from the gall bladder itself. In two the fibromuscular coat was implicated, in one the subperitoneal, in one the mucosa, and in two the submucosa with spread to the mucosa and lumen. In two, bilharzial hepatic cirrhosis was present.

The gall bladder was involved in 6 more of the 82 cases, one showed catarrhal inflammation of gall bladder and stomach and hepatic cirrhosis, one had typhoid, one acute bacillary dysentery, one acute duodenitis with colonic schistosomiasis, one multiple pyaemic hepatic abscesses, and one showed amoebic abscess of the liver with *E. histolytica* lodged in the mucosa of the gall bladder. C. L.

BOUCHER (H.). **Etude du sang et des urines de trois bilharziens par les colorations vitales (rouge neutre, vert janus et bleu crésyl brillant).** [Study of Blood and Urine by Vital Stains in Three Schistosome Infected Persons.]—*Bull. Soc. Path. Exot.* 1934. Feb. 14. Vol. 27. No. 2. pp. 173-175.

On these 3 cases the conclusion is suggested that eosinophils are not merely a test of intolerance to parasitism but that they intervene actively in defence.

With Janus green no great success was achieved but with both neutral red and cresyl brilliant blue eosinophils at blood temperature were most active, moving at a rate of 60 μ in a few seconds, 10 per cent being still active in sealed preparations after 16 hours at 35°C. C. L.

CAWSTON (F G) **The Treatment of Bilharzia Infection.**—Reprinted from *Med Press & Circular* 1934 Jan 10 Vol 188. No. 4940 pp 37-39

Essentially a plea for treatment sufficient to kill male worms

The passing of dead eggs signifies at most death of female worms. It tells nothing regarding the more resistant males which themselves are presumably still present in cases where symptoms fail to improve. The use of eosinophil counts and complement fixation reactions is urged and comment is made on their absence from present records. Antimony potassium tartrate is again advocated in a month-long course, repeated if need be after an interval. It is, however, apt to be less effective if an insufficient course of foudin has already been given, e.g., one terminated when dead eggs are passed. C. L.

CAWSTON (F G) **The Testing of Treatments for Bilharzia Disease.**—*Jl Trop Med & Hyg* 1934 Jan. 15 Vol 37. No. 2 pp 22-24

Cawston reviews the subject and concludes as follows —

"Toxic effects from antimony therapy may be avoided by using skilfully regulated doses of the potassium salt in fresh solution

"Toxic effects may be due to excessive doses, but, when ampoules of antimony sodium tartrate or foudin are favoured, they may sometimes be explained by the sodium content." C. L.

FRÉGONNEAU (Werner) **Erfahrungen mit der Fouadin-Behandlung bei Schistosomiasis** [**Fouadin Treatment of Schistosomiasis.**]—*Arch f Schiffs- u. Trop.-Hyg* 1933. Dec. Vol 37 No 12 pp. 515-528

Fouadin is held cheaper and better than tartar emetic

In 124 cases the total dose was nearly always 45 cc., usually given in 9 or 10 daily injections. In 96 the urine was clear at the end of the course and in 36 of them later investigation confirmed this, in 7 it was clear after 14 days, in 14 there were living and degenerate eggs at the end of the course but none 4 to 14 days later, in 1 there were erythrocytes at the end of the course but normal urine 4 weeks later

As to side effects, 89 had none, 30 vomited generally after the 7th injection. There was occasional smarting at the site of injection, and sometimes slackness. An exhaustive table accompanies the paper.

C. L.

HILL (Rolla B.) & TEJERA (Enrique). **Esquistosomiasis en Rincón del Valle (Venezuela).** [**Schistosomiasis in Rincón del Valle (Venezuela).**]—*Medicina Países Cálidos*. Madrid. 1933 Nov. Vol. 6. No. 6. pp. 450-454 French summary (3 lines).

An account of the prevalence of this infestation in 1929 in the district of Rincón del Valle. The existence of schistosomiasis (*S. mansoni*) in Venezuela has been known for several years. In 1917 ITURBE called attention to an endemic focus of it in Federal District, and in the previous year RISQUEZ found the adult worm in 19 out of 86 autopsies

on patients mostly from Caracas. In the same year ITURBE and GONZALEZ found 30 per cent of 400 specimens of *Planorbis guadalupensis* containing cercariae indistinguishable from those of *S. mansoni* [this *Bulletin*, Vol 10, p 114]

The authors considered it would be interesting to re-examine persons in the Rincón del Valle district. They obtained faecal specimens from 200 individuals of all ages up to 60 years. The district is a suburb of Caracas, about 1 kilometre south of the river Guaire and separated from it by a chain of small hills. Of the 200, 63 were positive, 31 of 87 males, 32 of 113 females. Almost half, 98, were under 15 years of age, and 38 of these were positive, the heaviest infection being 17 out of 27 between 10 and 15 years.

Of 100 specimens of *Planorbis guadalupensis* 25 were infected with the cercariae. Incidentally, other helminthic infestations were recorded among the same 200 persons, 117 or 58.5 per cent were passing ova of *Trichuris*, 91 (45.5) those of *Ascaris*, and 35 (17.5) those of *Necator*, altogether parasitism was present in 178 or 89 per cent.

H H S.

FAUST (Ernest Carroll) **Studies on Schistosomiasis mansoni in Puerto Rico. I. The History of Schistosomiasis in Puerto Rico.**—*Puerto Rico Jl. of Public Health & Trop. Med.* 1933 Dec. Vol. 9. No 2 pp. 154-161. [25 refs.] [Spanish version pp. 162-168]

This is the first of a series of seven articles, dealing with Mansonian schistosomiasis, which it is proposed to publish in consecutive numbers of this journal.

Its subject does not lend itself to abstract. The infection was first reported in Porto Rico by GONZALEZ MARTINEZ in 1904 when he found lateral-spined eggs in the faeces, while later in the year he recovered 219 schistosomes from the portal vessels of a patient. In January 1905 he forwarded worms to BLANCHARD with the suggestion that schistosomes producing enteritis and having lateral-spined eggs discharging in the faeces belonged to a new species. That species was, however, constituted by SAMBON in 1907. At various times percentages of infestation for Porto Rico have been published and have varied between 7.35 and 17.2. Diagnoses by skin reactions and from Banti's disease and other pyrexias, are mentioned.

C. L.

PONS (J. A.) & HOFFMAN (W. A.) **Febrile Phenomena in Schistosomiasis mansoni with Illustrative Cases.**—*Puerto Rico Jl. of Public Health & Trop. Med.* 1933. Sept. Vol. 9 No. 1. pp. 1-17. With 9 charts [Spanish version pp. 18-30]

Since rectal schistosomiasis is neglected as a local cause of fever, 7 cases are cited where this was a marked feature.

The diagnostic points were—bathing or wading in a stream in an endemic area, two hours afterwards itching, indefinite ill health for a week or two, sudden rigors and fever, taking various courses and often with bronchial irritation or apical infiltration, tenderness along the colon with tenesmus and frequent dysenteric stools, enlarged and tender liver, enlarged spleen, leucocytosis and eosinophilia, and at long last ova of *S. mansoni* in the stools.

C. L.

GOPSILL (W. L.) **Notes on the Occurrence of Rectal Bilharziosis in the Cholo District including Certain Eye Changes Common to both Rectal and Urinary Bilharziosis.**—*Ann. Med. Rep. on Health & Sanitary Condition of Nyasaland Protectorate for Year ending 31st December, 1932* Appendix III. pp 63-64

Gopsill continues his observations and contrasts them with those of the adjoining Lower Shire District (see this *Bulletin*, Vol 30, p. 208).

Of 325 inpatients 30 per cent showed eggs of *S. mansoni*, all in the faeces, and 20 per cent. showed those of *S. haematobium* in the urine and once in the faeces. Fever might occur after the third of a series of antimony tartrate injections, but if so the blood practically always contained malaria parasites. Conversely a case of severe malaria treated intravenously with quinine (gr v) had blackened, disintegrated ova in his stools, though quinine by mouth seemed to have no such effect. Eosinophils varied from 2 to 30 per cent, but in 100 hookworm-infected controls was never over 6. Conjunctivitis was aggravated by antimony tartrate, but cleared up under emetine. The value of the history of a week's bright red stools, perhaps years earlier, is again stressed as indicating the onset of bilharzial infection. The eye changes, mentioned in the earlier report as helping a diagnosis when ova are scarce, are more exactly described thus: "Congestion of the perforating branches of the anterior ciliary arteries, together with a microscopical change in the colour at the end of the arteries, somewhat resembling a bruise, but differing therefrom in the fact that the colour is blackish blue, and does not go through the changes seen in a bruise. In some cases as many as six blue patches occurred scattered about the sclera, in both the upper and the lower portions" C. L.

PEASTON (H.) **Preliminary Note on a Focus of *S. mansoni* Infection in Sierra Leone.**—*Ann. Trop. Med. & Parasit.* 1933. Dec. 20. Vol. 27. No 4. pp 497-499.

A focus of *S. mansoni* infection has been found at Kabala, Northern Province, Sierra Leone.

A stream here contains *Lymnaea elmetetensis*, *Bulinus forskali* and a *Planorbis* whose identity is being investigated but which has emitted cercariae of "human type." Since then the stream bottom has been cleared, with great diminution of *Lymnaea* and *Planorbis* C. L.

BIGGAM (A. G.), HASHIM (M.) & GHALIOUNGUI (Paul). **Treatment of Papilloma by Diathermy in Intestinal Bilharziasis.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934. Jan. 31. Vol. 27. No. 4. pp. 409-412. With 1 plate.

The pathology and clinical picture of intestinal schistosomiasis are briefly outlined, and treatment of papillomata by diathermy is described.

The reproduction of an X-ray negative shows how papillomata may be shown up, as filling defects, in a colon partially distended by a barium enema. These lesions persist after adequate antimony treatment and should be attacked by diathermy through a sigmoidoscope. The treating electrode consists either of a pair of spoon-shaped terminals closed by a trigger, or of a loop of wire. The inexperienced should determine by experiments on meat or heart muscle the amount of current needed, for too much may injure the intestinal wall with serious

results. Many papillomata may be treated at a sitting and this may be repeated weekly. The treatment is painless, has given rise to no serious haemorrhage in the author's hands, and has got rid of the dysenteric symptoms which characterize the condition. C. L.

PAKIAM (A. X.) **A Short Note on the Epidemiology of *Schistosoma japonicum* Infection among Immigrant Chinese in Malaya.**—*Malayan Med J.* 1933 Dec Vol. 8. No 4 pp 294-295.

Search of post-mortem records at the Tan Tock Seng Hospital, Singapore, suggests that the Min River, Fukien Province, and the territory round it is an endemic focus of *S. japonicum* C. L.

PENSO (Giuseppe). Sulla presenza di *Planorbis Boissyi* (Potiez e Michaud, 1838) var. *libica* (v. n. Penso 1933) in Tripolitania [*Planorbis boissyi* var. *libica* in Tripolitania.]—*Arch. Ital. Sci. Med. Colon* 1934 Feb. 1. Vol. 15. No. 2. pp 112-117 With 2 figs. English summary (5 lines).

In Tauorga, near Misurata, Tripolitania (Northern Africa) is a small endemic focus of urinary schistosomiasis. The only mollusc found was a *Planorbis*—the genus usually associated with the rectal form, *S. mansoni*—which differs from *P. boissyi* in the following particulars [constructed from the text]—

<i>P. boissyi</i>	<i>P. boissyi</i> var. <i>libica</i>
Inferior surface umbilicated. Shell yellowish-brown or greenish.	Both surfaces umbilicated. Shell yellowish-grey, never brown or greenish
Peristome has notched margin, and lower part almost straight	Peristome much more oblique, margin linear, sharp, not notched.
Diameter of terminal spiral is to the penultimate as 3 : 1.	Diameters are as 4 : 1.
Total diameter of shell 12-16 mm. with average of 13 mm.	Total diameter varies between 9 and 14 mm with an average of 12 mm.

[Nowhere in the article is found any statement to show that this species was an intermediate host of the Schistosome (except that no *Bulinus* was seen), nor does it appear that any experimental work was undertaken to test this vital point.] H. H. S

HELMY (M.) Rôle du réservoir d'Assouan dans la dissémination des *Bulinus* en Egypte. [Part played by the Assuan Reservoir in the Spread of *Bulinus* in Egypt.]—*Bull. Soc. Path. Exot.* 1933. Dec. 13. Vol. 26. No. 10. pp 1265-1267 With 2 figs.

*Bulinus** is not confined to terminal irrigation canals in Egypt but is carried to Egypt from the sudd marshes and the lakes which form the sources of the Nile.

The snails are found within the zone of the Assuan barrage, not in the main mass of water but on the "shara" plant abundant in creeks and bays formed by the dammed up water. They live on the masses of *Potamogeton crispus* equally in Egypt, the Sudan and south of this, and these are swept down, with the annual flood, to Lower Egypt C. L.

*As BAYLIS has pointed out (*Ann Trop. Med. & Parasit.*, 1931, Vol. 25, p. 369, see this *Bulletin*, Vol. 29, p. 408) the proper form of this generic name is *Bulinus* Müller, 1781, *Bullinus* being a variant introduced by OKEN in 1815. C. L.

MACARTHUR (W P) **Cysticercosis as seen in the British Army, with Special Reference to the Production of Epilepsy.**—*Trans. Roy Soc. Trop Med & Hyg* 1934 Jan 31. Vol 27 No 4 pp 343-357 With 1 text fig & 6 figs on 4 plates Also in *Jl. Roy Army Med Corps* 1934 Apr Vol 62 No. 4 pp 241-259 With 7 figs

The title was chosen, not as suggesting that this important disease is peculiar to the Army, but because MacArthur's experience has been limited almost entirely to soldiers serving or discharged

About 100 soldiers are yearly discharged from the army for "epilepsy", during 1933 twenty cases of cysticercosis were identified at Millbank, during the past trooping season eight were so identified, 6 having been invalidated as epileptics and the 2 others as having had some kind of seizure. Since most of these cases have no history of tapeworm and presumably have never harboured one, the incubation period cannot be fixed, where *Taenia solium* (which provides the cysticercus under discussion) has been present, symptoms have first shown themselves when the man was in hospital for treatment for this, or at any time up to several years later. Prodromal symptoms have been headache, fever, myalgia or muscular swellings, or symptoms may be entirely absent in men with advanced muscular infection. Palpable cysts may be few or many, they may appear singly or in crops, may increase, decrease and disappear, sudden increase, judging by excisions, means death of the embryo, and in the brain probably implies appearance of symptoms. Actually the changes round cerebral cysts are—marked cellular response to a breadth of about 3 mm, necrosis if the patient survives, and later perhaps enclosure by neuroglia sclerosis. As X-rays show, the scolex may calcify and later the cyst wall, which in muscle is elongated in the direction of the fibres, but in brain is globular for the pressure there is equal on all sides. The interval between the cyst's death and calcification of the scolex is put at about 3 years in muscles, but considerably longer in the brain. Apart from a diagnosis of epilepsy, cerebral cysticercosis has passed as hysteria, cerebral tumour, disseminated sclerosis, acute encephalitis, melancholia, acute mania, delusional insanity and dementia praecox. The men are apt to be careless, untrustworthy and undisciplined. One type passes into another, "an early emphatic entry, 'NO FITS,' does not preclude a final one 'Died in status epilepticus'."

As regards diagnosis, a minute examination from head to foot of a stripped man may disclose no nodules. Eosinophilia, and skin and complement fixation tests may be negative even with heavy infections. Examination of an excised cyst clinches the matter, but apart from that repeated examinations are essential in doubtful cases. Although diagnosis benefits the man himself but little, the presence of cysticerci gives him material gain when it has been caused by service abroad, it gives him great mental ease when he can be assured that there is no chance of epilepsy appearing in his children, and when mental deterioration necessitates his certification as insane it carries to his relatives no slur of familial lunacy. The most dangerous time is from the 6th to 8th year after presumed infection. As a rule there is steady mental deterioration, yet mental alertness may accompany persisting epilepsy and in a few cases fits have ceased. In treatment the fact that many and widespread cerebral cysts are the rule points away from surgery, unless there is some *persistent* localizing sign; and should any parasitocidal drug be found it might well make matters worse. Of

indigenous cysticercosis in England there is no evidence, but MacArthur thinks that surprising results might follow a general inquisition on epileptics

In discussion Sir Leonard ROGERS had found cysticercosis common in Calcutta. The experience of Hugh CAIRNS gave no support to cerebral operation, for cysts were many, yet papilloedema was quite slight. W. Aldren TURNER pointed out the importance of considering cysticercosis in epilepsy developing after the age of 30. D. B. BLACKLOCK quoted STEPHENS's investigation of habitat (105 brain, 30 muscle, 2 skin) and concluded either that the skin was more commonly infected now than formerly or that many brain cases remained undiscovered. A. E. HAMERTON reported the presence of cysticerci in the spinal cord, with spastic paraplegia, in animals in the Zoological Gardens. Hamilton FAIRLEY pointed out that the logical sequence of the theory propounded by Col. MacArthur was that cysticerci should be kept alive as long as possible—specific drug therapy was definitely contra-indicated. Serological tests had been disappointing, as contrasted with those on hydatid cysts, schistosomiasis and loa infections. F. P. MACKIE detailed certain investigations which should be taken in India to throw light on the matter. In reply Colonel MacArthur reported one patient after high papilloedema who had died blind, body cysts were often absent, and might be absorbed completely or easily overlooked, the fluid in cysts was clear with only a few degenerate cells and no eosinophils, the points brought up by Colonel MACKIE were being investigated. An agency transmitting amoebic cysts might be effective in conveying oncospheres of *T. solium*. C. L.

MORRISON (W. K.) **Cysticercosis in Twin Brothers aged 13 Years with a Radiological Study of the Calcified Cysticercus in Twelve Cases.**—*Brit Med J* 1934. Jan 6 pp 13–14 With 1 fig

Cases recorded as illustrating the importance of considering cysticercosis when there are epileptiform fits.

A boy born in 1920, first fit at 18 months, second at 3½ years, went to India in 1926, returned 1928, third fit 1931, fourth 1932, fifth and sixth 1933; X-rayed in 1933 to determine condition of pituitary fossa, with disclosure of 9 cysticercus-like shadows in the brain; further X-rays showed 23 in the limbs; had never had a tapeworm, no nodules. His twin brother showed one cysticercus-like shadow at right base of neck; no nodules; had a tapeworm on board ship on the way home, cured in 1929; no fits. Mother radiographed with a negative result. The figure shows the varied X-ray appearance of cysticerci. The diagnosis is dealt with. [Did he, then, obtain his infection in England?] C. L.

- i. YOSHINO (K.) **Studies on the Postembryonal Development of *Taenia solium*. Part II. On the Youngest Form of *Cysticercus cellulosae* and on the Migratory Course of the Oncosphaera of *Taenia solium* within the Intermediate Host.**—*Taiwan Igakka Zasshi* (Jl. Med. Assoc. Formosa). 1933. Nov. Vol. 32. No. 11 (344). [In Japanese pp. 1569–1586. With 19 figs. on 2 plates. [37 refs.] English summary pp. 155–158.]
- ii. —. **Part III. On the Development of *Cysticercus cellulosae* within the Definite Intermediate Host.**—*Ibid.* Dec. No. 12 (345). [In Japanese pp. 1717–1736. With 3 text figs. & 18 figs. on 2 plates. [22 refs.] English summary pp. 166–169.]

These two papers carry on the description of development from the stage already reported [*ante*, p. 117] to that of infectivity.

i The first describes development up to 12 days and 13 hours in the pig. Onchospheres, freed in the upper part of the small intestine enter the mucosa in 15 to 48 hours, shedding their hooks in the process, and reach organs and muscles in 24 to 72 hours. These youngest cysticerci when seen in the intestinal wall, generally in the mucosa, are greyish white, measure 0.021 to 0.03 mm., and consist of round cells, with congested vessels in the tissue about them, they are rarely found in the abdominal cavity. In internal organs at 24 to 72 hours they are light-greenish and grow to about 0.03 by 0.055 mm. In the liver at 72 hours they are found in the blood vessels. After 6 days, 15 hours they are generally still solid, lying in organs and muscle and measuring about 0.4 by 0.3 mm., having an outer membrane which surrounds polymorphic cells with protoplasmic processes, and centrally showing a myxomatous stellate appearance with gradual degeneration into liquid. At 12 days 15 hours the cysticerci are "remarkably large and cystic," the fluid is sticky, the cyst wall thin, consisting of a cuticle and subcuticle with an accumulation of ovoid cells at one spot, they are found in liver, brain and muscles (skeletal and cardiac, cell distribution suggesting that they have migrated a short distance between fibres). The whole picture leads to the conclusion that most of the onchospheres which enter the intestinal wall are carried by the blood stream to organs and muscles, those dying which pass on into the abdominal cavity.

ii. This paper carries on the detailed development till infectivity is reached at 60 to 70 days after infection, by which time the bladder measures 5.6 to 8.5 mm. by 3.1 to 6.5 mm., though growth does not then cease. At 20 to 30 days the rudiment of the scolex and its receptaculum become distinguishable, at 40 to 50 days there are 4 suckers and a hook-bearing rostellum. The histological details of growth are dealt with, and it may be mentioned that at 40 days the rostellum bears needles, which gradually take on a curve and the shape and arrangement of the adult hooks.

C. L.

YOSHINO (K.) **Experimental Studies on the Formation of the Scolex of *Taenia solium*.**—*Taiwan Igakka Zasshi (Jl. Med. Assoc. Formosa)*. 1933 Dec. Vol. 32 No. 12 (345) [In Japanese pp. 1737–1750. With 11 figs. on 1 plate. English summary pp. 169–171.]

Development from the cysticercus was watched in various media and followed in hosts.

Complete evagination of a scolex in a cysticercus can rarely be effected, but evagination is completed in 4 to 24 hours at 38°C in artificial intestinal juice or "in salt solution of a certain concentration." In dogs evagination is completed in the intestine 3 hours after swallowing the cysticercus, and the structure is that of the adult worm except for the remains of the cavity in which the unevaginated head had lain. Evagination is effected by the movement of the creature, and microphotos show the scolex alive in artificial gastric juice or in the intestine of the experimental dog after 254 days, with the strobile about 1.5 cm. long in each case.

C. L.

MILLER (Harry M.), Jr. **Specific Immune Serums as Inhibitors of Infections of a Metazoan Parasite (*Cysticercus fasciolaris*).**—*Amer. Jl. Hyg.* 1934. Jan. Vol. 19. No. 1. pp. 270–277.

"These studies demonstrate that it is possible to arrest an infection of the larval cestode, *Cysticercus fasciolaris*, in the rat, by means of

serum from infected rats. If it is found that other species of hosts can be immunized against their larval cestode parasites it may be possible to prevent the development of the larvae by similar means. If this should prove to be feasible, it may be, in the case of a relatively slow-developing form like *Echinococcus granulosus*, that immune serums can be used effectively at longer intervals after infection than is the case for *C. fasciolaris*, which grows relatively rapidly." C. L.

JOYEUX (Ch). Les données parasitologiques concernant le kyste hydatidique du poumon [Hydatid Cysts of the Lung : Diagnosis.]

—*Arch Méd Gén et Colon*. 1932. May. Vol. 1. No. 5 pp 277–283.

OLMER (D). Éléments du diagnostic clinique du kyste hydatidique pulmonaire.—*Ibid* pp 284–290. With 8 figs. on 2 plates

BERTHIER (J). Kystes hydatiques du poumon. Etude radiologique et examens de laboratoire.—*Ibid* pp. 291–297. With 8 figs.

Joyeux considers the zoological position and epidemiology of the hydatid, according to DÉVÉ 8·5 per cent and to MADELUNG 11·9 per cent of cysts in man are pulmonary. Microscopic examinations of the sputum are considered, and precipitins, complement fixation (varying in success from 17 per cent by LEMAIRE and THIODET to 84 per cent. by FAIRLEY), and intradermal reactions

Olmér in dealing with clinical diagnosis notes that a pulmonary cyst is generally single and slow growing, dyspnoea, cough, pain and haemoptysis may be absent, so may be dullness if there is lung to the depth of 5 cm. over it. Pleural and general signs are considered, as are those following rupture or infection of a cyst

Berthier emphasizes that the X-ray shadow is rounded and clear cut as if drawn by a pair of compasses. The differential diagnosis with pulmonary tumours is considered and illustrated by plates. The well-known microscopic evidence is marshalled. C. L.

DÉVÉ (F.) L'échinococcose secondaire expérimentale de la souris blanche. [Experimental Echinococcosis in the White Mouse.]

—*C. R. Soc. Biol.* 1933 Vol 114. No 31. pp 455–456

Intraperitoneal inoculation of "hydatid sand" produces in white mice a pathological picture sufficiently consistent to be of use in estimating the results of drug treatment.

The course of such infection up to 3 months has already been reported (*ante*, p. 121). The present note deals with the condition of 4 mice 162, 163, 200 and 200 days after inoculation. Cysts covered the whole surface of the peritoneum but were absolutely limited thereto; and this cavity also was packed with detached cysts, each of which was covered by a living fibro-cellular membrane containing lymphocytes, large mononuclears with nuclei more or less pycnotic, fibroblasts, fibrocytes, histiocytes, very few polynuclears, but absolutely no eosinophils and no giant cells. C. L.

JOYEUX (C.), BAER (J.) & MARTIN (R.). Recherches sur les sparganoses. [Researches on Sparganosis.]—*Bull. Soc. Path Exot.* 1933. Nov. 8. Vol. 26. No. 9. pp. 1199–1208. With 1 fig.

The discussion leads to the suggestion that *S. proliferum* is perhaps a teratological form induced by growth in a non-optimum host.

The paper is in the nature of a report preliminary to a monograph. Having listed the species of the two subgenera of *Diphyllobothrium*, namely *Diphyllobothrium* and *Spirometra*, facts collected from experiments with *D* (S) *manson* and *D* (S) *ernacei europaei* are related, particularly those dealing with the question whether proliferation occurs. Perhaps the basic consideration of the authors is the number of calcareous corpuscles which occur in a square of a definite but unstated size. These are 80 to 100 in the anterior extremity and 17 to 124 in the posterior. Fairly often a sparganum divides into fragments, which may die or remain lively and motile, but if alive never have the density of calcareous corpuscles exhibited by the scolex. Experimentally beheaded spargana of both species have been injected into the abdominal cavities of various animals and on 36 occasions have been found alive on autopsy up to 123rd day (in the white rat), but never has a scolex been re-formed, judging by the criterion mentioned. Even in a series of experiments with a calcifying regime, namely excess of vitamin D and Osborne's salt (NaCl 100, Ca³, (PO⁴)² 110, magnesium citrate 65, citrate of iron 10, iodine 0.05, KI 0.1) there was no significantly greater calcification than in controls. Moreover a condition which must be distinguished from proliferation is the finding of spargana in pairs, as for instance has been the case in the guinea pig 15 days, and in the tree-frog *Hyla arborea* 50 days, after infection by feeding—periods judged too short for attainment of the condition which simulates duplication by proliferation. Certainly bifurcated or ramified forms may be produced (two photographs testify to this) but not a scolex, and so the suggestion is made that *S. proliferum*, which has been found only in man, so that no further development can be expected, is a monster growing in an unsuitable environment. C L

i. HOUEMER, DODERO & CORNET. Les sparganoses animales et la sparganose oculaire en Indochine [**Animal Sparganoses and Ocular Sparganosis in Indo-China.**]—*Bull. Soc. Méd.-Chirurg. Indochine* 1933 June Vol 11 No. 4. pp 425–451. With 4 figs. [25 refs]

ii CORNET (Emmanuel). Essai de traitement de la sparganose retro-bulbaire. Deux cas et deux succès. [**Treatment of Retro-Bulbar Sparganosis.**]—*Ibid.* pp 452–455 With 4 figs

i. Sparganosis is considered in detail and cases illustrating new points are added

Only *S. mansoni* is in question here. The differences in the developmental cycles of *S. mansoni* and *S. proliferum* are pointed out, as well as the fact that ocular sparganosis is obtained by the application over inflamed eyes of eviscerated frogs and reptiles, though a list of 30 hosts, mammals, birds, reptiles and batrachians, shows how ubiquitous is sparganum infection. The tissue reaction is not due to bacterial entrance with the sparganum for the nodule contents are sterile, but probably to the activity which the heat of a warm-blooded animal induces in the helminth. The habitat in animals is various and not limited as in man; when a sparganum is swallowed the posterior part is digested, but in a favourable host the anterior part grows into a tape-worm, and in an unfavourable one becomes re-encapsuled. Prevention lies in giving up frog poultices, in periodic anthelmintic treatment of domestic dogs and cats, and in the burning of the viscera of all dead ones. The clinical aspects and symptoms are dealt with. An eosinophilia may

be produced Lesions consist of fibrous nodules, surrounding parasites or their remains, fibrous tunnels connecting the nodules, and a semilar-daceous fibrosis surrounding the whole The wall of the focus consists of 4 layers, from within out fibrin enclosing lymphocytes, polymorphs being very rare, loose tissue containing giant and fixed cells and haematoidin crystals (the last also found in the inmost layer), lymphocytes, plasma cells and vessels, an outer stratified fibrous layer Manifestations appear 2 or 3 days after infection The differential diagnosis is considered Treatment is essentially surgical by extirpation, but [by calling out what seems to be a thermotaxy] through application of heat it seems possible to entice parasites which have been left behind to come to the surface

11 Retrobulbar injection of 40 per cent alcohol destroyed spargana in two cases in which it was used The reaction was painless, the sterile debris were evacuated by incision where pointing, and cure followed, after a transitory paralysis of the muscles reached by the injection C. L.

LAPAGE (G) **The Cultivation of Infective Nematode Larvae on Cultures of *Bacillus coli*.**—3rd Rep. Univ. of Cambridge Inst. of Animal Path. 1932-33 pp 237-271 [39 refs]

The importance of *Bact. coli* as the food of free living larvae of parasitic nematodes is confirmed, and the question of the carrying over of these and other bacteria into the host is considered

It has been found that infective nematode larvae may be induced in a bile-serum medium to undergo development to the next ensheathing, and that if they then die the medium occasionally becomes septic from a growth of *Bact coli* originating from the intestines of the larvae It is on bacilli so procured that McCoy's conclusions (that these form the staple larval food) are confirmed. It has, then, been shown that some encysted infective larvae contain bacteria in the intestine, but by no means all Since, when the second ecdysis takes place, the intestine normally contains bacilli the question is discussed whether all these are normally digested by the larva or whether they may be retained in its intestine. If so bacterial infection may in this manner be carried into the host when the worm larva enters it. It is felt that progress in selecting media may enable the whole life history of [parasitic] nematodes to be followed under controlled conditions thus leading to successful control and treatment of disease C. L.

STEWART (James); SHEARER (George D). **The Effects of Nematode Infestations on the Metabolism of the Host. Part I. Metabolism Experiments [STEWART]. Part II. The Isolation of a Substance capable of inhibiting Enzyme Action [STEWART] Part III. The Effects of Nematode Infestations on Mineral Metabolism [SHEARER & STEWART].**—3rd Rep. Univ. of Cambridge. Inst. of Animal Path. 1932-33. pp. 58-76; 77-86; 87-129. [23 refs.]

These experiments on the metabolism of sheep should be kept in mind when considering the possible effects of parasitism by nematodes in man.

Heavy infections of nematodes lessened digestion of protein and apparently of crude fibre. From the nematodes themselves was

extracted a body which in *in vitro* experiments was shown to inhibit the action of pepsin. It is termed "nezyme" and to its action is attributed the poor condition and general emaciation of heavily infected animals. Nematode infections, too, interfere with calcium and phosphorus but not with sodium and potassium metabolism, and by this means, it is concluded, may be explained the retardation of skeletal growth which occurs in young animals so infected. C. L.

BUCKLEY (J. J. C.). "Some Observations on Two West Indian Parasites of Man."—*Proc. Roy. Soc. Med.* 1933 Dec. Vol. 27. No. 2 pp. 134-135 (Sect. of Comp. Med. pp 8-9).

The two parasites are *Syngamus nasicola* Linstow, 1899 of which *S. kingi* of Leiper 1913 is held to be a synonym, and *Filaria ozzardi* which was nurtured to the stage of infective larva in *Culicoides* sp.

In the nasal cavities of sheep and cats in Trinidad *syngamus* was found. Those from the sheep were recovered also from cattle and goats and were identified as *S. nasicola*. "The morphological resemblance between this species and *S. kingi* is so well marked as to leave little doubt as to their identity, and sheep, goats and cattle are thus incriminated as hosts of this potential human parasite." Attempts to transmit infection of the cat's *Syngamus* to other cats by feeding with infective larvae were entirely negative, and it is believed an intermediate host may be necessary in the life cycle.

In the case of *F. ozzardi* in a *Culicoides* sp., the "sausage" larvae lie in the thorax 3 days after an infective feed, after 8 days, and apparently 2 months, the larvae, now 3 times their original length and 4 times their original breadth, lie in the head, and on decapitation of the insect and gently pressing on the head wriggle slowly out of the proboscis.

C. L.

LE ROY DES BARRES (A). Dilatation énorme du cholédoque par ascaris. [Great Dilatation of the Common Bile Duct by Ascaris.]—*Bull. Acad. Méd.* 1934 Mar 6. 98th Year. 3rd Ser. Vol. 111. No. 9. pp 336-337.

The condition was discovered at laparotomy and two worms removed from the hugely dilated duct.

A woman of 36 had a 2 years' history of epigastric pain, vomiting, subicterus, and wasting. Ascaris eggs were present in the stool and 3 worms passed after santonin. After operation santonin removed 10 more. C. L.

HARROWER (Gordon). Acute Haemorrhagic Pancreatitis due to *Ascaris lumbricoides*.—*Malayan Med J.* 1933. Dec. Vol. 8. No. 4. pp. 295-298.

The symptoms were those of acute abdomen with jaundice and death. There was at autopsy fat necrosis in the omentum, haemorrhage and necrosis throughout the pancreas, and an ascaris impacted in the common bile duct. C. L.

ASHFORD (Bailey K.), PAYNE (G C) & PAYNE (F.). **The Larval Phase of Uncinariasis.**—*Puerto Rico Jl. of Public Health & Trop Med* 1933. Dec Vol 9 No 2 pp 97-134 With 3 charts. [Spanish version pp 135-153]

A closer discussion, with protocols, of the remarkable epidemic of ancylostome infection acquired during sea bathing [*ante*, p 122].

This paper, in addition to giving much detail, stresses the feature on which the authors base the inference contained in its title. There was a leucocytosis, highest in the first 3 months, and that leucocytosis was eosinophilic, in the case from which fewest worms were recovered (7 only) reaching 91 per cent.

"The continuance of a well-defined secondary anemia with few intestinal worms, and the history of a severe skin invasion with the marked changes in the leucocytes, heretofore noted, should make us think of the retention in the body tissues of the majority of the larvae whose complete cycle has been interrupted, especially when good food and the use of iron fail to cause a rise in blood values . . . Thus, there seems to be a true larval phase of uncinariasis. It is indicated by loss of strength and weight, anemia, irregular fever, a definitely high eosinophilia and leucocytosis, possibly diarrhoea, and a light intestinal worm burden. Indeed, there may be no worms at all in the intestine, no ova from which to make a diagnosis, and only the blood and the history of the case to suggest a larval invasion and a frustrated uncinariasis."

As to treatment: "In this connection we must remember Maurice Hall's wise observation that the limitations of an anthelmintic can hardly be known save after a hundred thousand well-observed administrations."

It appears from the protocols [contrary to the conclusion drawn from reading the preliminary report] that in none of the 7 cases was deparasitization achieved even after 3 to 8 treatments with carbon tetrachloride and hexylresorcinol, the grave case (case 1) having still 2,600 ova per gram of faeces. An eighth case of chronic ankylostomiasis is cited by way of contrast.

"Blood sucking and hemorrhage from wounds caused by the worms in the intestine, while they nearly cost the life from hemorrhage of at least one of the seven preceding cases when these worms were immature and actively changing their feeding-ground in the intestine, in old chronic cases, where the worms are mature and lie with their heads quietly buried in the mucosa, they probably do not ordinarily cause enough hemorrhage to account for all of the anemia present."

The paper should be consulted for detail.

C. L.

MATSUMOTO (K.). Ueber Wachstumsstörungen bei Infektion mit *Ankylostoma duodenale*. [**Disorders of Growth in *A. duodenale* Infection.**]—*Fukuoka-Ikwadagaku-Zasshi* (*Fukuoka Acta Med.*). 1933. Oct. Vol. 26 No. 10. [In Japanese German summary pp. 91-92.]

Matsumoto set himself to determine whether the short stature of Japanese is hereditary or acquired.

The paper is long with many tables, evidence of much work. The faulty German summary does not seem to do it justice and is difficult to understand. It is, however, clear that the height at 12 and 13 years averaged 123.8 cm and 126.4 cm. in those infected with "*Ankylostoma duodenale*," and in those free from this infection [the diagnostic technique is unmentioned] 126.1 and 128.1 cm. respectively. In certain cases, too, a highly infected village held shorter children than did one with a lower infection rate. The matter is left there in the summary.

The bibliography does not contain the names of those who have worked particularly on the subject

The appended extract* from the "Times" of January 23rd brings humour if not light to the subject C L.

ANDREOTTI (Aniello) & SCAMARCIO (F. Carito). L'anchilostomiasi alle porte di Napoli [**Ankylostomiasis in Naples.**—*Policlinico Sez. Prat.* 1934 Jan 15 Vol 41. No 2 pp 54-56]

The authors have met with several patients in Naples—they give brief accounts of ten—with anaemia, dyspnoea, oedema, symptoms which led them to examine the faeces and hookworm ova were found

They say that there are hundreds of families living in the plain between Naples and the slopes of Vesuvius under conditions favouring infestation. The soil is manured with human faeces, and heaps of manure are deposited near cisterns. Infestation may thus occur from the soil or the drinking water. The possibility of the larvae penetrating the roots of vegetables and so becoming infective for man is mentioned [but no warning is given against confusing larvae of hookworm with free-living nematodes which may occur at the roots of vegetables]

H H S

WAKESHIMA (Tadasu). **Experimental Studies on the Tropisms of the Mature Larvae of Hookworms. IV. Report. Phototropism, Thermotropism, and Barytropism of the Mature Larvae of *Ancylostoma caninum***—*Taiwan Igakku Zasshi* (Jl. Med. Assoc. Formosa). 1933. Nov Vol 32 No. 11 (344). [In Japanese pp. 1533-1548 With 2 figs [24 refs] English summary pp 152-153]

The investigations already reported [*ante*, p 127] are extended to the tropisms noted in the title

Phototropism—In a closed agar-containing tin larvae of *A. caninum* distributed themselves evenly. When such a tin had a 3 mm. wide hole bored on one side, larvae placed in the centre moved preponderantly towards light, but if they had first been kept for 24 hours at 35°C or for 2 hours at 40°C. they crept into the dark

Barytropism—Whether tested by a vertical agar plate or a vertical strip of blotting paper no influence of gravity could be determined

Thermotropism—Larvae moved in agar towards the warmer parts.

C L.

EISMA (Molle). Die Differentialdiagnose des dritten Stadiums der Larven von Ancylostomidae bei Mensch, Hund und Katze. [**Differential Diagnosis of Third Stage of Larva of Ankylostomes of Man, Dog and Cat.**—*Acta Leidensia* (*Scholae Med. Tropicae*). 1932. Vol 7. 160 pp. With 99 figs (29 on 8 plates). [64 refs]

After describing the material and technique, there are minutely detailed the infective stages of *N. americanus*, *A. duodenale*, *A. caninum*, *A. braziliense* and *U. stenocephala*, their biometrical investigation and a key for differentiation of species. C L.

*From *The Times* of Thursday, January 23, 1834 Price 7d. The *Court Gazette of Japan* promulgates the following curious imperial decree:—"All the young inhabitants are recommended to apply themselves to the art of growing tall. Those who shall attain 20 years of age without reaching their full stature shall receive the bastinado until they have a sufficient growth"—*French Paper*

SCADUTO (Pasquale) Alcuni animali da cortile ed i passerì quali vettori della diffusione a distanza delle uova di ankylostoma [Sparrows and Farmyard Animals as Spreaders of Hookworm Eggs.]—*Arch Ital. Sci Med Colon* 1933 Nov 1 Vol 14 No 11 pp 705-711 [14 refs] English summary (4 lines)

The author administered orally to sparrows, chickens, ducks, turkeys and rabbits small quantities of human faeces containing ova of hookworm. In every case, after a few hours the eggs were passed and culture proved them to be viable. The author is of opinion that the risk of dissemination by these birds is not a small one. H. H. S

MAPLESTONE (P. A.) & MUKERJI (A. K.) **Carbon Tetrachlorethylene in the Treatment of Hookworm Infection.**—*Indian Med Gaz.* 1933 Nov Vol 68 No 11 pp 617-620 [12 refs]

Carbon tetrachlorethylene [in combination] is at least as efficient against hookworms as is carbon tetrachloride and is safe, as experiments on cats show.

The study is that of 50 cases treated in hospital as follows: To two ounces of saturated solution of magnesium sulphate in a four-ounce flask were added 4 cc of tetrachlorethylene and 1 cc of oil of chenopodium. It is this mixture of drugs which was actually tested and not tetrachlorethylene alone. The mixture was shaken till the finest possible even emulsion was formed. "The dose is then given to the patient immediately, before the drugs have time to coalesce into larger drops and float to the surface, as they will do if the mixture is left standing. . . We consider that the even diffusion of the drug throughout the draught gives it a much better chance of coming into contact with all the worms on the gut wall, and it is therefore more efficient than if given as an undivided globule of one drachm." Having already concluded that egg counts are not a dependable measure of anthelmintic efficiency (this *Bulletin*, Vol 30, p. 205) the authors relied on a negative result to D C F, made at least 10 days after treatment. As so gauged the cure rate was 62 per cent after one treatment and 74 per cent. after two, 60 per cent suffered from toxic symptoms (giddiness 42, vomiting 18, nausea 8, drowsiness 2). The symptoms were never severe and the uneducated state of the patients necessitated answers being obtained by means of leading questions. It must also be noted that these symptoms may be compared to the effects of drunkenness. In view of the work of CHRISTENSEN and LYNCH [above] the condition of heart and lungs was watched in 10 cases, pulse and respiration rates were unchanged and the fall in blood pressure was slight and practically negligible. Mapleston and Mukerji note that in their previous investigation they obtained a cure rate of 20.7 per cent. [this *Bulletin*, Vol 27, p 419]. [Separating from this cited paper cases in which tetrachlorethylene was given alone from those in which it was combined with oil of chenopodium the cure rate in the latter was 26.2 per cent. (11 of 42) and in the former 8.3 per cent. (3 of 36).] C. L

GARRISON (Harvey F.). **A Comparative Study of the Value of Tetrachlorethylene as a Means of Ultimate Control and Eradication of Hookworm Disease in Children.**—*Southern Med. J.* 1934. Jan Vol. 27. No. 1. pp. 24-28.

Tetrachlorethylene, it is concluded, is the safest, the most economical, and the best treatment known for hookworm disease. The conclusion is evidently based on institutional treatment in bed.

The paper was read (in the Public Health Section of the Twenty-Seventh Annual Meeting of the Southern Medical Association) because of the apparent continued prevalence of hookworm disease in the Southern United States in spite of all that has been done to eradicate it. It records over 5,000 "routine stool examinations" (which perhaps means smears) in the Mississippi Baptist Hospital with 15 per cent. positives, 398 "stool examinations" in two Civilian Conservation Corps Camps in South Mississippi with 50 per cent positives, and of examinations by "the brine floatation method" of over 600 children in institutions situated in the city of Jackson. The paper evidently deals in detail with these last, the institutions being sewer-connected and free from soil pollution. The treatment regime was strict.—At 4 p.m. magnesium sulphate. No supper. No breakfast next day, which was spent in bed. The drug at 6, 8 and 10 a.m. in doses of 1 cc., or 3 cc. in all to a child of over 10 (M. iv. to 0.5 cc. to those under 10). Magnesium sulphate at noon. No food till it had acted. The course was repeated twice at weekly intervals so that in all 9 cc. were taken. Such triplicate courses were given regularly in April and in August to all whom the microscope showed to be infected just before the treatment session was begun. In this manner and dosage oil of chenopodium was given to 180 children [this is greater than the minimum lethal dose for an adult, its ascaridole content is unstated] and 39 per cent. remained infected. Similarly 229 children received carbon tetrachloride [in double the minimum lethal dose for an adult] and 45 per cent. remained infected. Finally 218 cases were treated with tetrachlorethylene, many being newcomers, others the uncured from other treatments, and only 7 per cent. remained infected. Since then over 300 cases had been treated with tetrachlorethylene, some series of them with 100 per cent. of cure, while a complete resurvey of the institutions last August showed only two infected and "they had received only one treatment."

In discussion H. C. RICKS reported several deaths in Mississippi from oil of chenopodium which had, however, been continued in the belief that the risk from hookworm was greater than that from the drug. The dose used for those of 15 and over was 2 cc. He thought it regrettable that the worm load had not been determined by Garrison before treatment. W. S. LEATHERS felt that an estimate of the residual worm burden based on the Stoll egg-counting method would have been interesting as an indication as to whether eggs "may have been reduced to the point where the number of hookworms harboured were of no pathological significance." He believed tetrachlorethylene would activate ascari in the same way as did carbon tetrachloride, such infection constituting a contraindication. In reply Garrison remained unimpressed by the argument for egg counts. His aim was the complete eradication of hookworms, and nothing less.

C. L.

WAKESHIMA (Tadasu), YOSHINO (Kozen) & NARIHARA (Norio). **Application of Ascaridol in the Treatment of Ancylostomiasis, and Efficacy of the Anthelmintics in Relation to the Species of Hookworms and their Sex.**—*Taiwan Igakka Zasshi* (Jl. Med. Assoc. Formosa). 1933. Dec. Vol. 32. No. 12 (345). [In Japanese pp. 1751-1763. [22 refs.] English summary pp. 171-172.]

The anthelmintic effects of ascaridole, the active principle of oil of chenopodium, alone and with carbon tetrachloride, are reported in 36 cases.

The routine was, microscopic examination, treatment, search of the stools for 3 days, and re-examination by the microscope after an interval which is not stated [The microscopical technique is unstated in the summary so that the reported results are of relative, not of absolute, value, particularly in view of the statement by H. H. HOWARD (this *Bulletin*, Vol 14, p. 159) that "Even with an interval of 14 days between treatment and re-examination, there still exists a very material element of error in the negative findings" when the drug was oil of chenopodium] Those who completed the course numbered 36 in 2 groups, 19 receiving 0.9 gm. of ascaridole, and after 30 minutes taking 40 cc. of castor oil (group A), and 17 receiving 0.6 gm. ascaridole and 1.6 cc. of carbon tetrachloride followed, after 30 minutes by infusion "of 7 gm. of folia sennae with 28 gm. of magnesium sulf." (group B). Group A expelled an average of 12.79 worms with 18.18 per cent. of cures, and group B 15.06 worms with 60 per cent. of cures. Necators and males were expelled earlier than ancylostomes and females. Mild intoxications were shown by 63 per cent. in group A and 70 per cent. in group B.

C. L.

KALANTARIAN (H.) Zur Trichostrongylosis in Armenien. [*Trichostrongylus Infestation in Armenia.*]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934. Jan. Vol. 38. No. 1. pp 41-43

Thymol produced in a man the following result —*Taenia saginata* 1, ascarids 8, enterobius 217, trichostrongylus 4. The last were identified as *T. colubriiformis* 1 male, *T. vitrinus* 1 male, 1 female, *T. skrjabini* 1 female

C. L.

CORDI (J. M.) & OTTO (G. F.) The Effect of Various Temperatures on the Eggs and Larvae of Strongyloides.—*Amer. Jl. Hyg.* 1934. Jan. Vol. 19. No. 1. pp 103-114. With 1 graph. [14 refs.]

These experiments were carried out on *S. fulleborni* from the chimpanzee, *Anthropopithecus troglodytes*, in which the stage passed in the faeces is the egg and development is indirect, but it is felt that the species is so closely related to *S. stercoralis* that the authors' findings must be almost directly transferable to the latter species.

Nevertheless, in face of this difference the reviewer finds it difficult to isolate the facts likely to be important for human strongyloides infection, particularly in view of FAUST'S "hyperinfective strain" —the larvae which reach the filariform stage in the bowel. In this worm none do so, and the percentage which reaches this stage indirectly at 37°C. is very small. The authors, however, note that a "strain" which ordinarily hatches in the body may be better adapted for development at body temperature, especially if it reaches infectivity within the body. As regards *S. stercoralis* they note that stools swarming with larvae when passed were negative after 12-15 hours in the ice-box, and that it is customary to keep them so pending examination. They add that the poor power of adaptation of strongyloides eggs and larvae to temperature changes seems to account for their limitation to tropical and subtropical belts.

C. L.

KILDUFFE (Robert A.) The Bachman Intradermal Reaction in Human Trichinosis.—*Amer. Jl. Med. Sci.* 1933. Dec. Vol. 186. No. 6. pp. 802-808.

The author prefers eosinophilia to intradermal reaction in the diagnosis of trichinosis.

As the result of applying both tests to 33 persons exposed to infection it is concluded that examination for eosinophilia is technically simpler and always feasible, while the antigen is difficult to prepare and not always available, in delicacy and constancy of appearance eosinophilia is a reliable index in man, so that the intradermal test has no practical advantages. The antigen used was supplied by SCHULTZ and obtained by passing isolated larvae many times through a Baermann apparatus, so that they were freed from foreign protein. The possibility of eosinophilia being due to quite other causes is not noted.

C L

AUGUSTINE (Donald L.) **Studies on the Subject of Prenatal Trichinosis.**
—*Amer. J. Hyg.* 1934. Jan. Vol. 19. No. 1. pp. 115-122

"Observations on rabbits, rats, swine and a child born of trichinous mothers confirm the conclusion of Staubli (1909) that prenatal infection does not occur in trichinosis."

Observation on the mother and child were as follows —

"A twenty-five year old primipara, contracted trichinosis approximately three weeks before parturition took place. The blood expelled with the placenta and all collected in the third stage was saved and examined for parasites. None was found. The placenta was carefully studied and there was no evidence of parasitic invasion in the numerous sections taken. On the fifth day after the birth of the child, the mother's eosinophile count was 24 per cent, and that of the child was 3.5 per cent. Skin tests were performed six months later by Dr. Friedlander. Positive reactions were obtained with the mother, but the test with the child was negative."

"The absence of eosinophilia in the child, the negative skin test and the negative findings in the placental blood and tissues were accepted as indicating that the infection had not entered the fetus."

C L

PALLISTER (R. A.) **Trichuriasis in Malaya.**—*Malayan Med. J.* 1933, Dec. Vol. 8. No. 4. pp. 303-305

Two unusual cases are reported whose symptoms are attributed to heavy trichuris infection.

1. A boy of 3 with dysenteric symptoms, 40 per cent haemoglobin, ova of hookworms and trichuris in the faeces, and trichuris visible and picked off through the sigmoidoscope, was, after trials with other drugs, given an enema of 2 drachms of carbon tetrachloride and half a drachm of oil of chenopodium of unstated ascaridole content emulsified in 8 ounces of water. This treatment was repeated twice. The total bag was —maggots 60, ascaris 1, hookworms 15, whipworms 884.

2. Autopsy on a Tamil woman (who had suffered from fever, cough, watery stools without blood or mucus, haemoglobin 45 per cent, much emaciation) showed a moderate infection with hookworms and roundworms in the small bowel, and in the large bowel masses of whipworms which must have numbered many thousands. The largest mass was in the descending colon where there was superficial ulceration.

C. L.

HELLSTEN (H.). Till fraagan om oxyuris' paavisande, forekomst och betydelse. [The Demonstration, Incidence and Significance of Oxyuris.]—*Nord. Med. Tidskr.* 1933. Vol. 6. pp. 1358-1363. [33 refs.]

This study, conducted in Lund, Sweden, deals with 410 persons in whom a search for threadworms in the rectum was made by means of a

palpating finger on which a vaseline-impregnated rag was carried. The material thus obtained was shaken up in water and ether and then centrifuged. The search for eggs yielded positive results, the frequency of which increased with the age of the persons examined. Thus, among 60 infants there was not one positive result, whereas among 240 children in hospital between the ages of 1 and 15 there were 99 harbouring oxyuris eggs (41.25 per cent). Between the ages of 10 and 15 (80 children examined) the infestation-rate was as high as 58.75 per cent. Positive results were obtained in 27 out of 40 school children between the ages of 8 and 13, and in 42 out of 60 inmates of an asylum.

Discussing the value of this rectal test for thread-worms, Hellsten notes that it is not absolutely reliable, for in a couple of cases in which oxyuris eggs could not be found in the rectum after repeated examinations, threadworms were found in the appendix in the course of an appendicectomy. On the other hand, a higher percentage of positive findings has resulted from rectal than from post-mortem examinations. As for the ability of threadworms to cause disease and the need for conducting a campaign against them, opinions continue to vary. Some hold that threadworms play an important part in the genesis of appendicitis, whereas BECKER has found them in 10.8 per cent. of acutely inflamed appendices, in 23 per cent. of those in which the inflammation had subsided, and in 54.2 per cent. of the appendices in which there was no sign of inflammation. It is, however, conceivable that threadworms may give rise to symptoms simulating those of appendicitis.

C Lillingston

GOODALE (Raymond H.) **Enterobius Vermicularis of the Appendix.**—*New England Jl. of Med.* 1934. Feb. 15 Vol 210. No 7. pp. 372-374. [14 refs]

The Pathologist at the Worcester City Hospital, Mass., U.S.A., reports as follows on appendices removed by operation:—

"In a series of 1,639 consecutive appendices, 101 (6.1 per cent) had oxyuris vermicularis in varying numbers in the lumen. The female patients are infected more than three times as often as male patients. The highest incidence of infection occurs during the first two decades. The seasonal incidence suggests infection during the school year." C. L.

VINKS (W. A.) & MCARTHUR (A. W.). **Santonin Poisoning.**—*California & Western Med.* 1933 Dec. Vol 39 No. 6. pp 409-410

Supported by two cases of poisoning in children by doses less than those advised in proprietary preparations, it is urged that santonin should not be given without prescription, that even so the child's physical condition, and not merely age, should be taken into account, and that the drug should not be given fasting.

In both cases "worm candies" were given by the mother for thread worms, dosages being 1 grain to a rather undernourished girl of 7 (printed directions allowing $2\frac{1}{4}$ grains), and $1\frac{1}{2}$ grains to a slightly underweight boy ($2\frac{1}{4}$ grains "allowed"). In both cases therapeutic starvation was markedly enforced. The toxic effects were stupor, jaundice, enlarged liver and in one case spleen, haematuria, to van den Bergh's test 0.8 and 1.5 mgm. of bilirubin per 100 cc. of blood. In both cases jaundice persisted for a week and grave symptoms for 2 and 3 days less. Red corpuscles were still present in the urine after 10 days in one

patient, and in the other, who had had marked right sided abdominal tenderness and resistance, persisted to some extent for a fortnight

C. L.

BACKHOUSE (T C) *Anopheles punctulatus* as an Experimental Intermediate Host of *Wuchereria bancrofti*. Some Preliminary Observations.—*Trans Roy Soc Trop Med. & Hyg.* 1934. Jan 31 Vol 27 No 4. pp 365-370

In both *A. punctulatus* itself and its variety *molucensis* larvae of *W. bancrofti* developed to morphological maturity.

Morphologically the microfilariae were *Mf. bancrofti*, not *Mf. malayi*. The feeder showed great variation in the numbers of microfilariae in a unit of blood between 9 and 10 p.m. Of 43 *A. p. molucensis* which fed, 20 survived for 14 days or more, 14 of these (70 per cent.) showed morphologically mature infective-stage larvae, and in 10 they were present in the labium. As HEYDON (this *Bulletin*, Vol. 29, p 475) pointed out, the infective larva is active inside the mosquito's body and Backhouse saw one twice enter the labium and withdraw to the head where it was found on subsequent dissection. *A. punctulatus* seems less tolerant of captivity than the variety, for of about 50, only 11 could be induced to bite, only 4 survived 16 days or more, and 3 of these showed anatomically mature larvae

C L

KORKE (Vishnu T) Observations on Filariasis in Some Areas in India. Part X. Gwalior State Area.—*Indian J. Med Res.* 1934. Jan. Vol 21. No 3. pp 569-580 With 4 graphs & 1 map.

This tenth report on the author's investigations covers examination of 1,041 stained thick films of night blood. The points of general interest are indicated in this quotation.—

"A marked contrast exists between the physical, climatic and crop conditions of the infected area of Gwalior State and the Gangetic Belt of Bihar and Orissa, although the incidence of infection in these two areas is almost the same.

"The endemic area of the Gwalior State is at an elevation of 500 to 1,000 feet above sea-level the country being dry and arid, while the Gangetic Belt at a lower elevation (200 to 400 feet) is damp and moist. The area in Gwalior State is subject to extremes of temperature, while the Gangetic Belt of Bihar and Orissa showing an equal filarial incidence is more moderate in climate and more humid. The former area is a land of dry cultivation, while in Bihar and Orissa rice is extensively cultivated under water. These differences in physical, climatic and crop conditions are striking and would serve to correct an impression, which has been conveyed by previous surveys, that an association of filarial infection with moist humid climate and low-lying rice growing areas is an essential one.

"The contrast between the incidence of filariasis in the plains area of Gwalior State and in the Malwa plateau is definite, and the absence of infection in the latter area would indicate that an investigation of the epidemiological factors in the two areas might afford an opportunity of determining the influence which various factors may have on the spread of infection."

C. L.

GOLDEN (R.) & O'CONNOR (F W) **The Roentgen Treatment of Filariasis. I.—Chyluria. II.—Filarial Lymphangitis.**—*Trans Roy Soc Trop Med & Hyg* 1934. Jan 31 Vol 27. No 4 pp 385-398 [21 refs]

The authors' opinion, expressed with restraint, is that benefit has followed Roentgen ray treatment in both conditions

Chyluria—After a short historical survey the technique is described, for which the original should be consulted. Seven cases were treated and details tabulated. The rays were applied in the kidney region. It is pointed out that owing to the short series and the short observation periods (3 months to 3 years) conclusions are tentative; nevertheless in all of them chyluria ceased for at least a time coincidentally with treatment. This was initiated because of the well-known sensitiveness of lymphatic structures to X-rays.

Lymphangitis and Adenitis—Fifteen cases are detailed in a table. At first merely focal spots were irradiated, but later the entire leg, and the impression was gained that larger doses and more prolonged treatment (as detailed) gave better results. As to these: 4 had no further attacks, one had a mild one and then nothing more (1½ years), one had occasional but milder attacks, in one a mild abortive attack occurred 2½ years after treatment, in one return to the tropics induced recurrence but another series of treatments was followed by freedom to date (9 months). In two, attacks were as before radiation. In five, including one loa case, judgment was difficult. One case is probably a record in the number of *W. bancrofti* recovered, namely 80 from 3 sets of groin glands. There are seemingly more worms in him since local symptoms have reappeared in the right iliac region.

Investigations continue in New York, but it is urged that they should be undertaken where the infection is indigenous

C L

GIBBINS (E G.) & LOEWENTHAL (L J A) **Cutaneous Onchocerciasis in a *Simulium damnosum*-infested Region of Uganda.**—*Ann Trop Med & Parasit* 1933. Dec 20 Vol. 27 No. 4 pp. 489-496. With 1 map [25 refs.]

Cutaneous onchocerciasis is discussed from clinical and entomological standpoints.

The history of the association between skin lesions and onchocerciasis is discussed, and authorities quoted for such association in West, Central and East Africa. The district now considered lies on either side of the Nile as it leaves Victoria Nyanza. The distribution of cases treated at Mulago Hospital, Kampala, almost coincided with that of *Simulium*. Accordingly investigations on the spot were undertaken. At Buwenda, where the Nile issues from the lake, practically all inhabitants suffered from lichenification, biopsy showed that 9 of 13 were infected, and 7 of 48 *S. damnosum* dissected showed embryos. Elsewhere none were found in the fly outside the gut. The skin lesions were of all kinds, papular and papulo-pustular to generalized lichenification, subcutaneous nodules were found in about a third of those having lichenification, and their dissection revealed adult worms. Cases were found, indistinguishable from cutaneous onchocerciasis, which had apparently followed other itching dermatoses such as scabies, and "it is just possible that the skin changes in onchocerciasis are due to long-standing attacks by the *Simulium*, whose bite can irritate for a period

of a week"; indeed there may be intense infection of the skin by larvae but no lichenification. Only regions inhabited by *S. damnosum* and *S. adersi* were investigated, but *S. neaveri* occurs in others, and further investigation will probably implicate other species. Since as many as 14 per cent of flies have been found infected, and since huge tracts of extremely fertile country are uninhabited through their ravages, while the lives of those living there are rendered most miserable by irritation from their bites, the question of their suppression is urgent. It is futile to attempt this by attacks on their breeding grounds, perhaps trapping may prove feasible.

C L

RIOU (M) Localisation anormale d'un ver de Guinée avec présence de nombreux embryons dans le pus [Unusual Site of a Guinea-worm.] —*Bull. Soc. Path. Exot.* 1934 Jan 10 Vol 27 No 1 pp 86-87

At Dakar the opening of a groin abscess showed this to be sterile but to contain numbers of guinea-worm larvae. The mother worm was then extracted by progressive windings, and measured 80 cm. long.

C L

BRUNELLI (Piero) Emetina e tartaro stibiato nella cura della bilharziosi vescicale —*Arch. Ital. Sci. Med. Colon.* 1934, Mar 1 Vol 15, No. 3 pp. 180-185. With 1 fig. English summary (3 lines)

FOSBERY (F W A) Schistosomiasis in China —*Jl. Roy. Nav. Med. Serv.* 1934 Jan Vol 20 No 1 pp 68-70.

GRAHAM-YOOLL (M A) Notes on *Schistosomiasis japonica* —*Jl. Roy. Nav. Med. Serv.* 1934 Jan Vol 20 No 1 pp. 63-68 With 1 fig.

GRISOLIA Y JURISTO (Manuel) Parasitismo intestinal en 200 habitantes de un distrito de Granada —*Medicina Paises Calidos* Madrid 1933 Nov Vol 6 No 6 pp 455-487 [52 refs.]

HECKENROTH & GUILLINY Sur un cas d'infestation double par *Fasciola hepatica* et *Schistosomum mansoni* chez un Somali —*Marseille-Méd.* 1932 June 25 Vol. 69 No 18 pp 817-821

MEZQUITA LOPEZ (Manuel) & GARCIA CORSELAS (Tomas) Parasitismo intestinal en el niño escolar —*Rev. San. e Hig. Pública* 1934 Jan Vol. 9 No 1 pp 16-28 With 5 graphs [41 refs.]

PALLARY (Paul) Sur la répartition des bullins et du planorbe de la Mitidja en Algérie —*Arch. Inst. Pasteur d'Algérie* 1933 Sept Vol 11 No 3 pp 455-463

PÓVOA (Hélion) Pathogenia da anemia ancylostomótica. Concerto moderno —*Folha Méd.* 1934 Mar 5, Vol. 15 No. 7 pp 73-76

SAVIGNONI (Ferdinando) & DE MARIA (Giorgio) Azione di alcuni antelmintici sulla madre e sul prodotto del concepimento (I danni provocati sperimentalmente negli animali gravidi colla somministrazione di dosi terapeutiche di tetracoloro di carbonio, cloroformio, estratto etero di Felce maschio e timolo.) —*Sperimentale*. 1933 Vol. 87, No. 5-6, pp. 557-584. With 16 figs. [35 refs.] English summary (6 lines).

TANTURI (Carlos Alberto). Los eosinófilos de la hidatidosis —*Semana Méd.* 1933, Nov. 16, 23 & 30 Vol 30, Nos 46, 47 & 48 (2079, 2080, 2081). pp 1493-1536; 1650-1655; 1698-1709. With 24 figs. [3 pages of refs.]

TROPICAL OPHTHALMOLOGY

A REVIEW OF RECENT ARTICLES. XXI.*

Trachoma—JULIANELLE & HARRISON¹ have conducted some experiments by which they claim to prove that an infection specific to trachoma can be conveyed from human patients to the eyes of monkeys (*M. rhesus*). THYGESON² has reported the result of some researches he has made in Tunis. Studying the question of the influence of the Prowazek-Halberstaedter inclusion body in twenty-three cases of uncomplicated trachoma, he was unable to come to any definite conclusion; but he remarks that the presence of cell inclusions is a common characteristic of many virus diseases though it is not constant, and the fact that trachoma shares this characteristic rather suggests that it belongs to the same class of disease. He isolated a variety of micro-organisms (none capable of reproducing the disease in man) from patients suffering from trachoma, but failed to find the *Bact. granulosis* of Noguchi though a saprophyte which closely resembled it was met with in 46 per cent of the cases. Serum reaction experiments proved negative. In two patients who suffered from trachoma which affected one of their eyes only, LUMBROSO³ succeeded in infecting the healthy eye by inoculating it from the diseased one. One of these patients had suffered from the disease for two years without any involvement of his healthy eye. These two writers⁴ report six inoculation experiments on the human subject with filtered trachomatous material. All proved negative. NICOLLE & LUMBROSO⁵ have now found that patients cured of trachoma can be reinfected by inoculation from a fresh case. CORNET⁶ advocates alcohol injections into the retrotarsal fold in addition to the use of roller forceps and the application of copper. Under local anaesthesia the entire membrane, including the plica and caruncle, is first curetted. The upper cul-de-sac is then crushed between the blades of a roller forceps and a saturated solution of copper applied on a mop. Up to one cc of alcohol and novocaine (alcohol à 45°-novocaine) free from adrenalin is next injected into the retrotarsal fold. The sac is irrigated with distilled water and an ointment of camphor and copper applied.

* For the twentieth of this series see Vol 31, pp 14-18

¹ JULIANELLE (L. A.) & HARRISON (R. W.). Transmissibility of Trachoma to Monkeys—*Amer Jl Ophthlalm.* 1933 Oct Vol 16. No 10 pp. 857-862 With 2 figs [11 refs]

² THYGESON (Phillips). Recherches expérimentales sur le trachome.—*Arch Inst Pasteur de Tunis* 1933 Aug. Vol 22 No 2. pp 157-177 With 1 coloured plate & 1 fig [11 refs]

³ LUMBROSO (Ugo). Recherches expérimentales sur le trachome unilatéral—*Arch Inst Pasteur de Tunis* 1933 Aug Vol. 22. No 2. pp 184-186

⁴ LUMBROSO (Ugo) & THYGESON (Ph). Etude de la filtrabilité du virus trachomatoux—*Arch. Inst. Pasteur de Tunis.* 1933 Aug Vol 22 No. 2 pp 178-183 [10 refs.]

⁵ NICOLLE (Charles) & LUMBROSO (Ugo). Nouvelles expériences de réinoculation du virus du trachome à des sujets guéris d'une atteinte naturelle—*Arch Inst Pasteur de Tunis* 1933 Aug Vol 22 No. 2 pp. 187-192.

⁶ CORNET (Emmanuel). Du traitement cupro-alcool-mécanique du trachome—*Bull. Soc Méd Chirurg. Indochine.* 1933. June. Vol. 11 No. 4. pp 474-477

In the *Revue Internationale du Trachome* for October 1933 Donato CATTANEO⁷ cites experiments he has made which he thinks suggest that the conjunctival membrane of some persons exhibits a peculiar susceptibility to the disease. He succeeded in causing a new attack in a cured trachomatous subject and in converting a mild attack into a severe one by inoculating the patients with fresh trachomatous matter. V. MORAX⁸ reviews the discussion held at the Madrid International Congress on the effect of constitutional and nutritional factors upon the disease. He disagrees with PITTALUGA's view that trachoma develops in the lymphatic type of subject whose resistance to every kind of microbic infection has been lowered by malnutrition. ROSTKOWSKI⁹ attempts to differentiate the varieties of granulation found in the conjunctiva. Some people have an excessive development of adenoid tissue throughout their system, and follicles in their conjunctival membrane are in no way pathological. This type, however, is particularly susceptible to infections and is liable to contract a follicular conjunctivitis in circumstances in which a more normal person would suffer from a simple conjunctivitis or would remain free from trouble. A follicular inflammation which develops in a membrane previously smooth is likely to be trachomatous, but only long experience enables one to make a sure diagnosis. The author's instrument for securing a double eversion of the upper lid with a full exposure of the retrotarsal fold is a valuable aid. [Thorough exposure of the fold can be secured and inspection facilitated, if the lid is everted and the membrane "ballooned" by injecting a syringe of fluid at the upper edge of the tarsal plate. This procedure, too, shows up any fine strands of fibrous tissue which may be present.] J. SÉDAN¹⁰ notes how very rarely pterygium and trachoma are found together in the same patient. He suggests that there may be marked differences in the membranes of individuals which favour the development of pterygium in one person and of trachoma in another.

In the issue for January 1934 A. F. MACCALLAN¹¹ reviews the clinical signs of trachoma. He commences by remarking that the diagnosis may be only a simple matter in well-marked cases, but in others it may be impossible to come to a definite decision. This warning, coming from an authority of such experience, is impressive. He considers the presence of grey follicles on the conjunctiva of the upper tarsus accompanied by new-formed vascularization of the cornea to be a pathognomonic sign of trachoma. Thirty per cent. of trachomatous Egyptians develop entropion and trichiasis in later life. TALBOT¹² discusses the seasonal epidemics of gonorrhoeal ophthalmia which occur in Southern Tunis. These commence in September and last

⁷ CATTANEO (Donato). La "iperrecettività" nel tracoma.—*Rev. Internat. du Trachome*. 1933. Oct. Vol. 10. No. 4. pp. 180-190. [16 refs.]

⁸ MORAX (V.). Le trachome au congrès international de Madrid. Constitution, alimentation et trachome.—*Rev. Internat. du Trachome*. 1933. Oct. Vol. 10. No. 4. pp. 190-193.

⁹ ROSTKOWSKI (Louis). Appréciation clinique des granulations de la conjonctive.—*Rev. Internat. du Trachome*. 1933. Oct. Vol. 10. No. 4. pp. 194-202. With 9 figs. [23 refs.]

¹⁰ SÉDAN (Jean). Pterygion et trachome.—*Rev. Internat. du Trachome*. 1933. Oct. Vol. 10. No. 4. pp. 207-209.

¹¹ MACCALLAN. The Clinical Signs of Trachoma.—*Rev. Internat. du Trachome*. 1934. Jan. Vol. 11. No. 1. pp. 3-10. [13 refs.]

¹² TALBOT. Trachome et cécité dans le sud tunisien.—*Rev. Internat. du Trachome*. 1934. Jan. Vol. 11. No. 1. pp. 14-19.

till the end of December and cause much blindness Both trachoma and gonorrhoeal ophthalmia specially afflict children and gonococcal ophthalmia is the more common. Some ophthalmologists in Tunis, however, regard the staphylomatous leukomata, which are so often the consequence of purulent ophthalmia, as being due to trachoma. SCHOUSBOE¹³ recounts the result of his investigations amongst Algerian children, and confirms the findings of other observers. Trachoma infection takes place during the early months of life from the mother and other members of the family, and the incidence of the disease bears a direct proportion to the poverty of the family Fresh infections from playmates in the streets aggravate the disease, and attention must be paid to these points when measures of prophylaxis are under consideration TRAPESONTZEWA & NIKOLSKAJA¹⁴ report a study they have made regarding the bactericidal action of chaulmoogra oil. They found that whilst it was quite inert as regards organisms of the typhoid and staphylococcus groups, it had a definitive selective action against the bacilli of Koch, Hansen and Löffler, and suggest that a combination of the oil with copper might prove very useful in the treatment of trachoma. With reference to SÉDAN's suggestion that an antagonism may exist between pterygium and trachoma, MACCALLAN¹⁵ remarks that this is contrary to his experience in Egypt and BARGY¹⁶ makes the same remark regarding Indo-China.

Hyaline Degeneration of the Conjunctiva.—DODERO & CORNET¹⁷ describe eighteen cases of degeneration of the periocular tissues seen in Indo-China. The palpebral conjunctiva, the tarsal plates, the fornix and the semilunar fold were the common sites of the affection, and the disease might be present in one or more at the same time. All showed an irregular thickening of the conjunctiva and a hyperplasia of the lymphoid tissue which might be either diffuse or follicular. Fibrous bands traversed the corium amongst which were islands of hyaline and amyloid matter, some of these being calcified or ossified. The disease causes considerable disability. The authors consider that trachoma plays an important part in the aetiology though other factors cannot be excluded.

Cataract.—BEDELL¹⁸ advocates full dilatation of the pupil when making a study of the lens. He considers that the most simple and comprehensive scheme for the classification of cataract should regard the embryonic, foetal, infantile and adult nuclei, the cortex and the capsule as integral but separable parts of the lens. He does not believe that diabetes causes any distinctive type of cataract even though it

¹³ SCHOUSBOE. Notions d'épidémiologie du trachome infantile tirées de l'étude de graphiques.—*Rev. Internat. du Trachome*. 1934 Jan. Vol. 11. No 1. pp. 19-29 With 4 graphs.

¹⁴ TRAPESONTZEWA (C.) & NIKOLSKAJA (Z) Des propriétés bactéricides de l'huile de chaulmoogra.—*Rev. Internat du Trachome*. 1934. Jan. Vol. 11. No 1 pp. 29-38

¹⁵ MACCALLAN. Pterygium and Trachoma.—*Rev. Internat. du Trachome*. 1934. Jan. Vol. 11 No. 1. pp. 38-39.

¹⁶ BARGY (M.). Pterygion et trachome.—*Rev. Internat du Trachome*. 1934. Jan. Vol. 11 No. 1. pp. 39-41.

¹⁷ DODERO & CORNET. Sur 18 cas de dégénérescence périoculaire observés en Indochine.—*Bull. Soc. Méd.-Chirurg. Indochine*. 1933. June. Vol. 11. No. 4 pp 456-468. With 5 figs on 1 plate. [34 refs.]

¹⁸ BEDELL (Arthur J). Some Remarks on the Etiology of Cataracts. Slitlamp Studies.—*Amer. Jt. Ophthalm.* 1933. Nov. Vol. 16. No. 11. pp. 945-950.

may be the aetiological factor in the ocular disease. The type which is characterized by widespread water clefts is probably the one which develops most rapidly. He has never found any form of cataract to be influenced by medical treatment.

ELLIOT¹⁹ has in two lectures dealt with cataract from the viewpoint of the general practitioner. Though primarily intended for practitioners in Europe most of the points are applicable to tropical conditions. The lectures do not deal in any way with operative technique, but are full of common-sense advice regarding conditions which concern the cataractous patient and his medical adviser. With respect to treatment which is intended to retard the development of a senile cataract, he remarks that the disease depends upon a perversion of nutrition associated with the advance of life, and has little confidence in anything but the administration of a suitable glandular extract. He earnestly protests against the antiquated custom of allowing a patient to become completely blind before undertaking an operation, and he also gives good reasons for advising the removal of a ripe cataract even though the patient's other eye has good vision.

WRIGHT²⁰ has made a valuable contribution to the literature of cataract extraction. He believes that there is in fact no such thing as senile cataract due to senility pure and simple, but there is a form of cataract of unknown origin which occurs in the aged. Various endotoxic conditions may be concerned in this disease; and hookworm infection may be a factor in some countries. He relies chiefly on the use of a trial bandage and on the employment of Herbert's method of perchloride of mercury irrigation to prevent sepsis; and he favours akinesis by injection of the temporo-facial division of the seventh nerve as it lies superficial to the neck of the mandible (O'Brien's method) and ciliary block. The author rightly protests against the old-fashioned custom of keeping the patient lying supine and still for long periods after the operation. He practises both intracapsular and extracapsular extraction, choosing the particular type of operation to suit the individual. He considers that a forceps extraction method is likely to prove the most successful form of intracapsular extraction technique in the hands of the majority of operators.

CHATTERJI²¹ has briefly reviewed the history of cataract surgery. He provides an interesting account of SUSRUTA's description of couching in the *Susruta Sanhita*, written about 1000 B.C. It is not quite clear whether this authority practised declination or reclinaton of the cataractous lens, but the cataract seems to have been approached from the anterior chamber, and it is stated that "if the puncturing (of the tunic) is properly done there will be an escape of fluid with a sound but improperly performed operations will cause bleeding and there will be no sound." The author has a predilection for the Smith operation and gives Smith full credit for developing his most valuable technique of orbicularis control.

¹⁹ ELLIOT (R. H.). Cataract Extraction from the Point of View of the General Practitioner.—*Post-Graduate JI* 1933. Sept. Vol. 9. No 95 pp.325-335.

²⁰ WRIGHT (Robert E.). The Operative Treatment of Cataract.—*Irish JI. Med Sci.* 1933. Oct. & Nov. 6th Ser. Nos 94 & 95. pp 549-566; 599-610

²¹ CHATTERJI (Niranjan). History of Development of Cataract Surgery and its Latest Improvement.—*Jl. Indian Med Assoc.* 1933. Aug. Vol. 2. No. 12. pp. 490-492.

Glaucoma—HERBERT²² has made a further note on the value of causing a small irido-dialysis when performing an iridencleisis operation for the relief of chronic glaucoma. He considers that such a measure, by inducing rapid and complete degenerative changes in the prolapsed iris, favours the development of a protective barrier of fibrous tissue in the neighbourhood of the prolapse. The fibrous elements are derived from the conjunctiva and do not interfere with filtration since they do not unite with the underlying sclerotic.

Retrolbulbar Neuritis—RAY²³ recommends the use of "Contramine" injections for the relief of such cases of retrolbulbar neuritis as are not due to disseminated sclerosis, diabetes and syphilis (unless the Wassermann reaction is negative after anti-syphilitic treatment). Tobacco and quinine amblyopias, too, fail to respond to the treatment. "Contramine" is an organic sulphur compound, and a course of six deep intramuscular injections is given. The dose varies from 0.25 to 0.5 gm according to the age of the patient and an interval of twenty-four hours is left between each injection. The drug may prove dangerous to patients who are suffering from diabetes, nephritis, or arteriosclerosis.

Oxycephaly.—SAWHNEY²⁴ reports the case of two Punjaubi brothers who both suffered from oxycephaly accompanied by complete bilateral ophthalmoplegia. The boys were aged five and eleven respectively. The condition was congenital and there were four other children in the same family who were quite healthy.

Quinine Amblyopia.—BARLING²⁵ has recorded an instance of quinine poisoning which occurred in London. The ocular changes were those ordinarily associated with the condition. On recovering consciousness the patient, a woman aged 44, found that she was completely blind. Her pupils were wide and inactive, the retinal arteries contracted and irregularly constricted at intervals, both discs dead white with sharply defined margins and patent lamina cribrosa. Some sight was regained after nine days and six weeks after the commencement of symptoms central vision in each eye had recovered to 6/12, but the fields of vision remained much contracted. She had taken as an abortifacient half an ounce of quinine sulphate. The whole quantity was consumed within twenty minutes, and unconsciousness set in about five minutes after taking the last dose.

Glare.—RUGG-GUNN²⁶ has contributed a comprehensive study of the comparative value of different varieties of glass in affording protection against rays likely to prove injurious to the eye. Tropical glare is the resultant of long-wave radiation from heated rocks and sand, diffuse luminous reflection and diffuse ultra-violet reflection. Tropical sunlight is characterized by a high ultra-violet intensity which is

²² HERBERT (H.). Supplementary Note on Iris Inclusion for Chronic Glaucoma.—*Brit Jl Ophthalm* 1934 Mar. Vol 18 No. 3 pp 142-148

²³ RAY (N. N.) Chronic Retrolbulbar Neuritis and Amblyopias of Toxic Origin. A New Method of Treatment.—*Brit. Jl. Ophthalm* 1934 Mar. Vol. 18. No 3. pp. 170-172

²⁴ SAWHNEY (M. R.) Oxycephaly in Brothers.—*Brit Jl. Ophthalm* 1934 Mar Vol 18 No. 3 pp 169-170. With 1 fig

²⁵ BARLING (B.). Quinine Amblyopia.—*London County Council Ann Rep* 1932. Vol. 4 Pt. 3 (Med Supp.) pp 137-139. With 1 fig

²⁶ RUGG-GUNN (A.). Data concerning Radiation and Protective Glasses with a Note on Retinoscopes.—*Brit. Jl Ophthalm* 1934 Feb. Vol 18 No 2 pp. 65-98 With 13 figs [70 refs]

constant throughout the year True ultra-violet conjunctivitis, apart from that experienced on snow-covered mountain ranges, is rather infrequent Photo-sensitization occurs in "snow-blindness," and one attack of such conjunctivitis predisposes to others Crookes's glass in every form is extremely opaque to ultra-violet rays, whilst reflecting glass, made by causing a deposit of a metal on the surface, is efficient in reflecting infra-red rays Gold obstructs 99 per cent of the infra-red radiation from a furnace heated to 1,050°C. PFUND produced twenty-five years ago a gold-plated glass in order to protect welders against infra-red radiation, and more recently IMRE has used platinum and silver as well as gold. The metallic film is deposited on the surface of one glass and is protected by another superimposed upon it, this type of reflecting glass is termed "laminated" The author concludes that Crookes' A 2, B.1 and B 2 should give efficient protection to those who exhibit glare intolerance, but contributing factors such as health disturbances and errors of refraction must of course be attended to in addition. A Crookes' B 1 or B 2 glass with a thin metallic film adherent to its outer surface should prove ideal for aviators in the tropics, and an aluminium deposit is likely to be more permanent than the other metals A laminated glass is advisable for use on snow-fields and the combination suggested is a Crookes' B 2 with a gold film deposit and a cover-glass of uranium glass.

Anti-rabic Inoculation—CORMACK & ANDERSON²⁷ report a case of double papillitis in which symptoms appeared twenty-four days after the patient had been bitten in the arm by a rabid dog. Antirabic treatment commenced two days after the receipt of the bite and ended nine days before the eye symptoms appeared. About two dioptries of swelling was evident, but no haemorrhages or exudates were present. The left eye was completely blind and vision in the right was reduced to 6/36. Recovery began after about two weeks treatment, and, except for a small scotoma in the left field, became complete after an interval of two months.

Sparganosis—JOYEUX, HOUEMER & BAER²⁸ have studied two varieties of Dibothriocephalidae responsible for ocular sparganosis in Indo-China. viz *D. mansoni* and *D. erinacei europaei*. They report that the former principally affects warm blooded vertebrates whilst the latter has an affinity for the frog tribe Either can penetrate the conjunctiva readily and cause ocular sparganosis The prevalence of the disease in the Far East is due to the native custom of using dis-bowelled frogs as a local application in the case of eye affections. HOUEMER, DODERO & CORNET²⁹ have made an important contribution to the literature of ocular sparganosis in which they discuss the history, symptoms and treatment of the disease Domestic animals such as dogs and cats harbour the adult worm and frogs, snakes and birds carry on the cycle. Unfortunately the local application of an eviscerated or a flayed frog enjoys an undeserved reputation amongst

²⁷ CORMACK (H. S.) & ANDERSON (L. A. P.) Bilateral Papillitis following Anti-rabic Inoculation: Recovery.—*Brit. Jl. Ophthalm.* 1934. Mar. Vol. 18. No. 3. pp. 167-168.

²⁸ JOYEUX (C.), HOUEMER (E.) & BAER (J.) Recherches sur la biologie des *Sparganum* et l'étiologie de la sparganose oculaire.—*Bull. Soc. Path. Exot.* 1934. Jan. 10. Vol. 27. No. 1. pp. 70-78. With 1 fig.

²⁹ HOUEMER, DODERO & CORNET. Les sparganoses animales et la sparganose oculaire en Indochine.—*Bull. Soc. Méd.-Chirurg. Indochine* 1933. June. Vol. 11. No. 4. pp. 425-451. With 4 figs. [25 refs.]

the Annamites as a cure for diseases of the eye, and infection of the periorcular tissues is likely to occur in consequence. Lodgement in the lid causes an irregular, painless swelling which is accompanied by some oedema. Subconjunctival infection leads to considerable chemosis and the formation of a small nodule. Proptosis occurs when the infection is retrobulbar, this may be sufficient to lead to lagophthalmos and corneal ulceration, a painless oedema of the lids is also likely to be present. The treatment lies in extirpation, but this may prove difficult when the number of the parasites is great. Ignipuncture may cause a worm which lies in an inaccessible position to move to a place more favourable for its removal. CORNET³⁰ found that the retrobulbar infections could be successfully treated by injecting behind the globe from 2 cc to 4 cc of 40 per cent alcohol with novocaine free from adrenalin. The injection may cause a temporary paralysis of an ocular muscle, but recovery takes place in about one month. The worm is killed by the alcohol and can be removed through an incision or be allowed to await absorption.

The Annual Report for the year 1932 of the Giza Memorial Laboratory well maintains the excellent standard of its predecessors. The activities of the laboratory include education and clinical consultant work as well as research and routine pathological examinations. The Director, R. P. WILSON, has several interesting observations to make upon the incidence and the relative importance of various ocular diseases in Egypt. Retinitis pigmentosa is very common and accounts for eight per cent of all retinal and choroidal disease. Myopia, too, is prevalent, and it is a common experience to find it to be a family complaint. Trachoma pure and simple causes but little blindness though it is a common cause of impaired visual acuity, and nearly all cases of the disease are complicated at some time by a secondary infection which often leads to corneal lesions. Ocular tuberculosis appears to be rare in the country, and, in view of the prevalence of trachoma, the question arises whether any antagonism exists between the two diseases. Dr. TOBGY has successfully treated "Bitot's spots" on the bulbar conjunctiva by painting them with pure carbolic acid. F. H. STEWART contributes an important paper on the significance of the Prowazek-Halberstaedter body in trachoma. He suggests that the bodies result from the phagocytosis of bacteria which, though not themselves the cause of trachoma, may carry the virus of that disease. The inclusions do not occur in trachoma unless it has been complicated by a secondary infection.

The Bulletin of the Ophthalmological Society of Egypt for the year 1933 comprises the papers read at the thirtieth session of the society. Naturally many of these are concerned with the subject of trachoma. MEYERHOF considers that an acute stage of the disease may occur. This has many symptoms in common with acute follicular conjunctivitis, swelling and tenderness of the preauricular gland being one. Granulations invading the upper limbus are, however, characteristic of trachoma. TOBGY comparing the new formed vessels seen in trachoma with those in spring catarrh, has found the former to be more congested and irregular, and to anastomose more freely. In spring catarrh the vessels have a smaller lumen and thicker wall whilst they bleed less readily. Experiments made by OLITSKY suggest that the

³⁰ CORNET (Emmanuel). Essai de traitement de la sparganose retro-bulbaire. Deux cas et deux succès.—*Bull. Soc. Méd.-Chirurg. Indochine*. 1933 June. Vol. 11. No. 4. pp. 452-455. With 4 figs

follicular conjunctivitis found in monkeys may be due to a specific organism. AMIN advocates the use of a "bridge-flap" in senile cataract extraction. Some of the speakers in the subsequent discussion appear rather to have exaggerated the difficulty of the technique and to have realized insufficiently that its chief advantage lies in securing a firm and early closure of the wound. TOBGY and ATTIAH review the recent forms of operative treatment for detachment of the retina.

H Kirkpatrick

MALARIA

- i. COLLIGNON (E). Observations générales sur la campagne antipaludique de 1932 dans le département d'Alger [**The Antimalarial Campaigns in Algiers, Constantine and Oran during 1932.**—*Arch. Inst. Pasteur d'Algérie*. 1933 Dec. Vol. 11. No. 4. pp 606–614 With 8 figs on 4 plates
- ii. AMBIALET (R.) Observations sur la lutte antipaludique dans le département de Constantine au cours du 2o semestre 1932 —*Ibid.* pp 615–636 With 10 figs on 5 plates
- iii. GOUGET (R.) Observations générales sur la campagne antipaludique de 1932 dans le département d'Oran —*Ibid.* pp 637–643. With 6 figs. on 3 plates.

1 The prosperity of agriculture and its consequent extension have been followed by a decrease in malaria

The dry season of 1932 was neither too hot nor too damp, and the rains at the end of the summer were sufficient to wash out the breeding places in the wadis (or wide, shallow water courses) without being so plentiful as to create temporary breeding places elsewhere; consequently, there was not very much malaria. An important factor in the reduction of endemic malaria has been the prosperity of agriculture, this has led to the regulation of water-courses and the draining of marshes. The improved standard of living has also played a considerable part in reducing sickness. The impounding of water for irrigation has reduced the number of pools in the water courses, and when the water is returned to the wadis, in the autumn, it flushes out the breeding places. One of the chief dangers to health lies in the improper use of irrigation water.

ii. Prophylactic quinine and antilarval measures give good results with a population concentrated in villages and accustomed to Europeans; they are much less successful with a suspicious scattered population

The department of Constantine consists of the coastal zone, and the zone of the high plateau. In the coastal zone, there are lakes and vast marshes, but the centres of colonization are generally situated at some distance from these collections of water; on the high plateau, however, water is scarce and the people live near the pools and rivers. The population on the coast is collected in villages, the people are in contact with Europeans and do not mistrust them, the labourers are employed on large estates owned by companies, and it is therefore easy to deal with them. On the high plateau, the people work on their own land where they grow cereals, they have little contact with Europeans, and they mistrust them; they are not collected into well-organized villages, and many of them are nomads. These circumstances make them difficult to deal with.

A considerable increase in malaria occurred in the autumn of 1932, both on the coast and in the highlands, but its effects were much more serious in the latter zone, where there is little endemic malaria and where many of the labourers come from non-malarious districts. Here, cases of pernicious malaria occurred but, in the coastal zone, where there is more endemic malaria and many of the labourers are in a condition of premunition, cases of severe illness were uncommon. Prophylactic quinization is easily carried out in the coastal zone, but not in the highlands.

iii. Malaria is not very severe in this department (Oran), and 1932 was not a bad year. The methods adopted were quinnization of the carriers, oiling, clearing and regulation of canals, and the distribution of *Gambusia* W. Fletcher

SCHWETZ (J.), BAUMANN (H.), PEEL & BELHOMMET. Contribution à l'étude de l'infection malarienne chez les pygmées de la forêt de l'Ituri (Congo Belge) [**Malaria among the Pigmies of the Ituri Forest.**]*—Bull. Soc. Path. Exot.* 1934. Feb 14 Vol 27. No 2 pp 199-208

The rate of malaria infection in pigmies is lower than that of other natives in the forest.

The authors have already reported the results of the examination of 91 adult pigmies and 28 children between the ages of 10 and 15 [this *Bulletin*, Vol 30, p 821]. The parasitic index of the adults was 25 per cent, and that of the children was 46 per cent, which was almost the same as the indices of the other natives living in the forest. During the year 1933, they have examined the blood of a second series, comprising 300 pigmies, many of whom were infants. This time they found that the infection rate of the pigmies was much lower than that of the other natives of the forest, but that a larger percentage of pigmies was infected with *Filaria perstans*, filarial infection becomes more common with increasing age, while malarial infection becomes less common. The exposure to the bites of insects was apparently the same in both groups. W. F.

LAL (R. B.) & SHAH (K. S.) **Malaria and Water-Logging. Being a Report on a Study of the Health Conditions prevailing at Chakanwala, Gujranwala District, Punjab, from November 1927 to January 1931, with Special Reference to Malaria in a Water-Logged Tract.***—Records of the Malaria Survey of India* 1933 Dec. Vol. 3 No. 4. pp. 583-634 With 11 charts & 2 maps

Reclamation for agriculture by drainage did not decrease the number of anopheles, nor have much effect on the incidence of malaria, but it improved the health of the population by increasing their prosperity. *A. stephensi* and *A. culicifacies* bred in water with a pH of 9.6.

The Punjab, the Land of Five Waters, stretches from the Himalayas in the north to the desert of Rajputana in the south. Between the five great rivers are strips of country known as the *doabars*. The piece of country with which this report is concerned lies in the Rechna Doaba between the Ravi and Chenab rivers. Before the advent of canal irrigation, the north-western part of this area was fertile, further south the soil was less productive, and irrigation was carried out from wells; still further south lay a waterless, almost rainless, desert tract. In 1894, the Lower Chenab canal was constructed to irrigate the drier parts of the area, and it commands about 2 million acres of land. Increased prosperity followed, and lasted for some years; but seepage from the canal and obstruction of natural drainage caused so great a rise in the subsoil water, in some districts, that the land became useless for cultivation. The soil in many parts was salt-bearing, and, with the rise in the level of the subsoil water, saltpetre efflorescence appeared on the surface. The Government acquired, in 1926, 3,465 acres of abandoned land in one of the worst water-logged tracts, and this

constitutes the Chakanwali Experimental Reclamation Farm. The reclamation operations consisted mainly of regulation of crops and an elaborate system of open seepage drains. In addition, a dispensary under the charge of a sub-assistant surgeon was established.

The actual level of the subsoil water was not materially lowered, *but the movement of the subsoil stream was greatly accelerated*, the surface of the land dried rapidly, large areas became available for cultivation, and there was plenty of remunerative work for the tenants. Though many permanent breeding places of anopheles were obliterated, the new drains formed fresh ones, and the number of malaria-carrying mosquitoes was not reduced; nevertheless the population appeared to have gained enhanced power of recovery from malaria as compared with the people of the control villages outside the farm area. This improvement is attributed partly to the presence of the dispensary, and partly to the better economic conditions resulting from the reclamation operations. The spleen rate was between 20 and 40 per cent. during most of the period of observation. The carrying mosquitoes were *A. stephensi* which bred in the slow-running open drains, and *A. culicifacies* which bred in casual collections of water. These mosquitoes bred prolifically in the highly alkaline water with a pH of 9.6.

W. F.

GUPTA (P), DAS (Ghanasyam) & MAJUMDAR (Nizamur Rahman)
Further Investigations into the Malarial Conditions at Kachugaon, Goalpara District, Assam, and the Results of Anti-Malarial Measures. [Abstract.]—*Records of the Malaria Survey of India* 1933. Dec. Vol. 3. No. 4. pp. 843-849.

A. minimus is the only important carrier in this area. The authors concluded as the result of their observations that the duration of treatment in malaria could be shortened by administering plasmoquine in addition to quinine, and that this reduced the number of relapses. They also concluded that atebrin might be advantageously substituted for quinine, and the duration of treatment shortened thereby. Good results followed the bi-weekly administration of 1/3 grain (0.02 gram) of plasmoquine and 4 grains of quinine as a prophylactic. Children were given euquinine and plasmoquine mixed with milk. Oiling was used on all permanent breeding places once a week, and temporary breeding places, rice fields, and the edges of streams were treated with Paris green, but these methods were very expensive.

W. F.

ASSAM MEDICAL RESEARCH SOCIETY **Report of the Year 1933.**
Malaria Section [SAVAGE (J. de la Mare), Malaria Research Officer].
—7 pp.

Rice Bran as a Larvicide.—In water near certain rice mills, no larvae are found. Rice bran dusted on water in petri dishes containing larvae of *A. maculatus* and *A. gigas* killed nearly all of them by suffocation in 24 to 72 hours. Similar results were obtained in field experiments. Rice bran is cheaper than imported soft stone, and is a suitable diluent for Paris green.

Anopheline Survey.—Three to four thousand specimens of each of the three species, *A. maculatus*, *A. minimus*, and *A. philippinensis* were dissected during the three years, 1931-3. The rates of infection were,

respectively, 0.4, 7.5 and 0.1 *A. maculatus* was experimentally infected with M T and B T parasites but not with quartan. It does not hibernate but feeds throughout the year.

Training classes—Seven sub-assistant surgeons and two laboratory assistants attended a course in laboratory and field work. W F

CENTRAL CO-OPERATIVE ANTI-MALARIA SOCIETY LD. **The Fourteenth Annual Report of the Central Co-operative Anti-Malaria Society Ltd. held at the Albert Institute on 18th February, 1934.**—57 pp. With 2 maps & 2 plates. Calcutta 1/2A Premchand Boral Street.

“ This Society is a purely non-official organization for improving the sanitary condition of the villages of Bengal, and is supported by voluntary contributions ” It assists in the organization of a network of public health societies throughout Bengal, helps them in taking preventive measures against malaria, kala azar, cholera, and other diseases, and acts as an expert advisory body to these societies. The Anti-Malaria League, which was founded in 1908 by Dr G. C. CHATTERJEE, was in reality the beginning of the present Society. There are now more than 2,000 affiliated societies established in different parts of Bengal. Antimosquito measures, such as filling up ditches, drainage, oiling and clearing, are carried out by voluntary labour and medical aid is given to members through funds raised by voluntary taxation.

The Secretary, Dr. G. C. CHATTERJEE, in his Annual Report for 1933, lays great stress on the interference with the free flow of the rivers as a cause of malaria. The water courses have been dammed for irrigation, they have been bunded to prevent flooding, they have been obstructed by sluices and weirs which block the tidal flow. All these obstructions prevent the free drainage of the country, and they also prevent the free passage of fish which devour the larvae of mosquitoes. Malaria can be readily controlled in limited areas by drainage and the application of larvicides, but it is economically impossible to extend such methods to the whole countryside, rural areas must be dealt with by biological methods such as the restoration of the free flow of water in the rivers, and the free passage of larvivorous fish. W. F

ROBIN (L. A.). Sur l'incidence de l'endémie palustre en Indochine méridionale et ses variations de 1926 à 1932 [**Endemic Malaria in S. Indo-China.**].—*Arch. Insts. Pasteur d'Indochine* 1933. Apr No. 17. pp. 11–58. With 18 graphs [18 refs.]

A general review of conditions as regards malaria in the different zones (see ROBIN, below)

The sanitary and medical services of Indo-China were first occupied with the endemic and epidemic gastro-intestinal diseases of the country, such as dysentery and cholera, which were the gravest causes of illness and death. It is only during the last 15 years that they have turned their attention to malaria. The opening up of the sparsely-peopled jungle of the semi-highlands (*région accidentée de moyenne altitude*, or R.A.M.A.) for rubber plantations, and the importation of labour to work on them, was followed by a serious increase in the disease which often assumed epidemic form. Its persistence in hyperendemic degree

became so serious a menace that, in 1928, the planters solicited the intervention of the Pasteur Institute of Saigon, and an antimalaria campaign was undertaken by Dr H G S MORIN. The brilliant results achieved by him decided the planters of Cambodia and the service of Public Works to hand over to the Antimalaria Service of the Institut Pasteur, of which Dr MORIN is the Director, the sanitary care of the coolies working on plantations, roads and railways. Since July 1930, the Governor General has extended the benefits of the anti-malaria service to cover the whole country.

Indo-China, from the point of endemic malaria, may be divided into 6 zones —Zone (1) The coast: the water is brackish, the anopheles belong to the *subpictus*, *ludlowi* group, and malaria is sometimes severe. Zone (2) The delta: rice is grown, and malaria is almost unknown, the population is large and cattle are numerous, the anopheles *sinensis* and *vagus* are abundant, and there is a fair sprinkling of *minimus*. Zone (3) The intermediate zone: the "terrasses," where there is pasture land. Malaria is endemic, but not serious, it yields to agricultural development, the anopheles are of several species, and *A. minimus* is plentiful. Zone (4) The semi-highlands or R A M A at an elevation of 70 to 1,000 feet. This is the zone of hyperendemic malaria. Jungle-clad and richly watered, it cannot be colonized by the local Chams or Cambodians, and even the Moïs are found only in nomad groups. *A. minimus* is present in abundance, *A. maculatus* is usually present, *A. jeyporensis* is sometimes present. Zone (5). The high Moï valleys, and the plateaux of moderate altitude in Central Annam. The climate here is less tropical because of the altitude, and there are seasonal variations of temperature which make this zone pleasant for Europeans. It is inhabited by Moïs and is more popular than zone 4. Malaria is sometimes severe, but it is seasonal. Anopheles are abundant; the species are: *A. jeyporensis*, *A. minimus* and *A. maculatus*. Zone (6). This includes the high mountainous country above 3,500 feet. The anopheles are *A. jeyporensis*, *A. fuliginosus* and *A. maculatus*, the last during the warm weather only. *A. minimus* is not found in these regions, and there is no malaria. The population is scanty, because the soil is poor and shallow.

The results of 37,000 blood examinations made at the Pasteur Institute of Saigon, between 1926 and 1932, show that, though malaria occurs all the year round, there are two seasons of maximum intensity. The first occurs in July and the second in December. The December rise in malaria, which is chiefly due to an increase in *P. vivax* infections, coincides with an increase in the numbers of *A. minimus*, the principal carrier; no similar increase accompanies the July rise, which is chiefly due to an increase in *P. falciparum* infections.

Since the year 1928, when the antimalaria campaign was opened with vigour on the plantations, there has been a considerable and progressive fall in malaria. During the years 1928 to 1932, the percentages of malaria patients admitted to hospital from the estates have been, respectively, 60, 32, 28, 25, 12. During this period, the numbers for the other parts of the country, which serve as a control, have remained more or less stationary. There has been a diminution during the last few years in the proportion of *P. falciparum* infections, as compared with infections by the other species of parasites, and this has led to a diminution in the number of severe cases of malaria admitted to hospital.

W. F.

ROBIN (L.). Variations saisonnières de l'incidence des diverses variétés d'hématozoaires en Indochine méridionale de 1928 à 1932. (Deuxième note) [Seasonal Changes in the Type of Malarial Parasites in Indo-China, 1928-32.]—*Bull. Soc. Path. Exot.* 1933 Nov 8 Vol 26. No 9. pp 1147-1153

The relative proportions of the different species of malaria parasite
The relative percentages of the different species of malaria parasites in southern Indo-China, for the four years 1928-32, were *P. falciparum* 59, *P. vivax* 25, *P. malariae* 15. These percentages vary during the course of the year. *P. falciparum* is always predominant, especially in the rains of July, while *P. vivax* is more common during the dry season in December than at other times of the year. The fluctuations of *P. malariae* are less marked, but it is rather more common in August and December than in other months. *P. falciparum*, which produces the most severe clinical symptoms, constitutes a greater proportion of hospital malaria than of malaria among healthy carriers, but with *P. malariae* the reverse is the case. The proportion of *P. falciparum* infections is becoming progressively less though the total amount of malaria has not decreased, and the author ascribes this qualitative improvement to the antimalaria measures which have been adopted.

W. F.

TOUMANOFF (C.). Recherches sur la transmission du paludisme au Tonkin. [The Transmission of Malaria in Tonking.]—*Arch. Insts Pasteur d'Indochine.* 1933 Apr. No 17 pp. 59-102 With 5 charts, 1 plate & 1 map. [35 refs.]

A. minimus is by far the most important carrier, *A. jeyporensis* comes next.

Dissections of different species of anopheles in Tonking over a period of 28 months have led to the following conclusions:—Five species have been found naturally infected, and these are:—*A. minimus*, *A. jeyporensis*, *A. aconitus*, *A. maculatus* and *A. vagus*. *A. minimus* was found naturally infected in tropical Indo-China for the first time by MORIN in 1928. The highest infection rate is found in this species, and it is the principal vector in the country. The infection rate differs in the different zones. In the deltaic region, precipitin tests which are now being made point to a probable deviation of this species by domestic animals. The amount of malaria in a locality depends very largely upon its physical characters, and in some limited areas the rate of infection is very high. Sporozoite infection of *A. minimus* occurs in both winter (the dry season) and summer (the wet season), but it is highest in the winter which is the time when this anopheles shows its maximum increase. Gland infections have been found in several *A. jeyporensis*, and it is probably an important vector in certain places. *A. maculatus* is difficult to catch in houses, and it is uncertain what rôle it plays in the malaria of Tonking. *A. aconitus* and *A. vagus* are probably not of very great importance as carriers.

W. F.

KUIPERS (I. J.) & STOKER (W. J.). Een *A. ludlowi*-epidemie in Oost-Java. [An *A. ludlowi* Epidemic in East Java.]—*Geneesk. Tijdschr. v. Nederl.-Indie.* 1934. Jan. 16. Vol. 74. No. 2. pp. 74-90. With 3 figs. English summary.

An epidemic of malaria conveyed by *A. ludlowi* is attributed to intermittent rainfall on a salt impregnated soil leading to great multiplication of this mosquito.

The fact that an epidemic of some kind was in progress was recognized by the sanitary authorities through the increase of the mortality returns from a definite district. An account is given by the authors of how it was ascertained to be malarial and how the mosquito *A. ludlowi* which breeds in brackish water, was incriminated as the sole infective agent. A large number of mosquitoes were dissected, 146 *A. ludlowi*, 964 *A. subpictus* and 2 *A. aconitus*, with positive findings of stomach oocysts in 44 and salivary gland sporozoites in 36. Altogether 68 *A. ludlowi* were found infected (46.6 per cent) and none of the other species. All the possible breeding places are considered in detail. During the east monsoon the clayey ground dries up. It is in the west monsoon that water may come to lie for a longer or shorter time. If the rain is continuous, standing water is sweet but if it is intermittent pools are brackish with the salt taken up from the soil. It is the latter condition which is favourable to *A. ludlowi* and which, owing to the rainfall conditions of 1933, led to the appearance of this dangerous mosquito in great numbers. "Shortly stated, the correspondence between the mortality curve, the rainfall curve, and the mosquito curve is the proof offered that the malarial epidemic at Brengkok was a consequence of the abnormal rainfall in 1933 in conjunction with a salt impregnated soil."

W. F. Harvey.

TEDESCHI (Carlo) & SCALAS (Antonio). Contributo alla biogeografia della malaria in Burhacaba (Benadir). [**Malaria in Burhacaba (Benadir).**].—*Riv. di Malarologia*. 1934 Vol. 13 No. 1 pp. 104–113. With 1 fig. English summary.

The village of Burhacaba (Italian Somaliland) has been regarded as free from malaria, but the authors have shown this to be erroneous. Actual cases of infection, it is true, were few, but the number examined was absurdly small. Of 17 children and 7 adults whose blood was now taken four showed *P. falciparum*, three with gametocytes. Of 200 children up to 10 years of age, 40, or 20 per cent., had enlarged spleen and of 100 adults 26 had enlargement. *Anopheles gambiae* were present in abundance and *A. rhodesiensis* in small numbers.

H. H. S.

SLIWENSKY (M). 5 Jahre kombinierte Malariabekämpfung in Bad Gorno-Panitscheri. [**Five Years Combined Antimalaria Measures in Gorno-Panitscheri.**].—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934. Feb. Vol. 38. No. 2. pp. 74–80. With 3 figs.

Results of antimalarial measures carried out in Bad Gorno-Panitscheri (Bulgaria) over a period of 5 years which commenced in 1928.

The program of the 5 years plan was:—1. Seeking out and treating thoroughly all plasmodium carriers in winter. 2. Removal by drainage of all stagnant water. 3. Antilarval and antimosquito measures during the whole malarial season. 4. Thorough treatment of all newly infected persons during the malaria season. Bad Gorno-Panitscheri is situated in one of the most beautiful parts of Bulgaria. The cost of the antimalarial measures was low, as the whole population gladly took part in carrying them out. As evidence of the improvement following these measures the author states that in 1928/29, 50 anopheles could be caught with ease in the houses in a short time, whilst in the last two years of the campaign only 1 or 2 could be caught with difficulty in the houses, cellars or stables.

E. D. W. Greig.

PICCININNI (Francesco). Relazione sulla campagna antimalarica in provincia di Milano durante l'anno 1932 (**Report on the Antimalarial Campaign in the Province of Milano during 1932.**)—*Riv di Malariologia* 1933. Nov-Dec Vol 12 No 6 pp. 1169-1192. With 1 folding map English summary p 1218

This report is too detailed for abstracting, except on very general lines. In the Province the areas dealt with have been divided into 66 Communes, and the population of each is given, the total cases and the percentages. For 36 of them the numbers of foci where anopheles was found—holes, pools, and marshes—the numbers of persons visited, the results of blood examinations and the age distribution of those attacked are given. Among the total population, 209,465 according to the 1931 census, there were 2,526 cases or 1.2 per cent, as compared with 2,851 or 1.36 per cent. Benign tertian was the predominating infection and the species of anopheles found was almost exclusively *A. maculipennis* var. *messeae*.

Apart from the elimination of the many small stagnant pools, there are still marshy areas to be dealt with, while it will be necessary to bank the Adda which at times inundates the adjacent land. At the same time the measures at present in use—treatment of patients and inspection and treatment of rice-fields and other breeding places—must not be neglected.

H. H. S.

LUTRARIO (A). La loi italienne du 22 juin 1933 pour diminuer les causes du paludisme [**The Italian Law of June, 1933, to reduce Malaria.**—*Bull. Office Internat. d'Hyg. Publique* 1933 Nov. Vol 25 No 11 pp 1982-1985.

Antimalaria work will be co-ordinated in each Province by a provincial committee. Free quinine and other drugs, and free medical treatment, are to be given to workmen, employees, and their families in malarious areas, at the cost of the concessionaires and contractors. When a man leaves a district he is given a health card which entitles him to free treatment and quinine for himself and his family for a period of six months. The family of a man who dies from pernicious fever is entitled to the same compensation as if he had died from the result of an accident. On the advice of the committee the prefect of a province can stop any work which interferes with drainage, and no quarries or excavations can be made without his sanction. Through him, the committee has power to enforce the adoption of antilarval measures and the screening of houses for peasants and labourers.

W. F.

MARTINI (E). Älteres ueber Malariaepidemiologie [**Epidemiology of Malaria. An Old Record.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934. Jan. Vol 38. No. 1. pp. 43-46.

An old contribution to the recently studied question of malarial infection contracted in autumn becoming active for the first time in spring.

BRAUNE in the *Archiv für Heilkunde*, 1870, published an account of 11 out of 12 persons who spent August and September 1868 at Borkum, an East Frisian Island, and developed tertian fever in a malaria-free locality in the spring. At the same time 7 persons developed malaria in the spring after a late summer visit to Norderney, in the same group of islands. The author diagrammatizes these 18 cases, four of whom

had fever in the autumn, the first attacks in the spring occurring in March (4), April (5), May (6). It appears that the summer of 1868 was hot and dry, so that conditions were favourable for the spread of malaria.

A. G. B.

WEYER (Fritz) Verlauf der Malaria in Ostfriesland 1932 und 1933 [**Malaria in E. Friesland, 1932 and 1933.**].—*Arch f Schiffs- u Trop-Hyg.* 1934. Mar Vol 38 No 3 pp 131-132

Table 1 shows the new malarial attacks in East Friesland in 1932 and 1933, and Table 2 the monthly average temperature in 1931 and 1932. To the question whether infection occurs in summer or autumn the author replies that *A. maculipennis* can be found in the houses in June, July and the beginning of August, but never in autumn or winter. The average temperature in these months was 14.9° in 1931 and 16.5° in 1932, so that the conditions for transmission in the latter year were more favourable.

Tables 1 and 2 (combined)

East Friesland	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Total
Monthly Average Temperature (°C) in 1931*	—	—	6.4	13.7	14.7	17.3	15.8	11.9	9.3	—
Fresh cases of Malaria in 1932	0	4	2	5	6	0	2	1	2	22
Monthly Average Temperature (°C) in 1932*	—	—	7.3	12.7	14.9	18.7	17.5	14.9	9.0	—
Fresh Cases of Malaria in 1933	1	20	26	52	54	22	3	2	1	181

*As recorded at Emden

A. G. B.

BARBIERI (Antonio) Resultados alcanzados en la lucha contra el paludismo en la última década. La reducción de la enfermedad en los principales centros poblados. [**Results of Antimalaria Measures in the Last Ten Years in the Argentine.**].—*Prensa Méd Argentina.* 1933 Feb. 15. Vol. 20 No 7 pp 375-381. With 6 figs.

The records presented in this article are given in somewhat general terms, figures being few. There has certainly been a great improvement in the incidence of malaria in the past ten or twelve years, as shown by the following percentages of the population in which "parasites were seen in the blood, mostly of school children": ten years ago, in the towns of Salta 22.9, Catamarca 21.6, Jujuy 21.3, Tucumán 15.2; and in other places, Monteros 47.7, Güemes 37.2, Metán and Rosario 36, and Concepción 29.7 per cent. are the chief. At the last record, 10 years later, the corresponding figures were: Salta, urban 6 per cent., Jujuy town and district 3.17, Tucumán urban 0.34, suburban 3.08, rural 10.3, Güemes 11.7, Metán 3.9, Rosario de la Frontera 17.1, Concepción 1.7. In the majority the prevalence has been reduced to one-fifth or less and in some, *e.g.*, Tucumán town, Concepción, Monteros and Medinas, malaria has been practically eradicated.

The usual methods had been adopted, general bonification, oiling and the use of Paris green, free issue of quinine, and educational propaganda in the schools. The article is illustrated with photographs showing canalization of streams at Jujuy, Monteros and Rosario de la Frontera.

H. H S

SCHWETZ (J), BAUMANN (H), PEEL & DROESHAUT Sur la différence de l'infection malarienne, d'après l'âge, constatée chez les nourrissons noirs de l'agglomération de Stanleyville (Congo Belge) (**The Differences of Malaria Infection according to Age verified in the Negro Babies of Stanleyville (Belgian Congo).**)—*Rev de Malariologia* 1933 Nov-Dec Vol 12 No 6. pp. 1147-1154 English summary (9 lines) p. 1217.

The infection of infants under 3 months old is relatively feeble and is due to *P. falciparum*, gametocytes are scarce. Scanty schizonts of *P. malariae* appear after the first month. After the 3rd month *P. vivax* appears, all parasites increase in numbers and gametocytes become plentiful. The parasites of all species reach their maximum towards the end of the first year, at which time gametocytes are very numerous. *P. vivax* disappears by the time the 5th year is reached, and *P. malariae* by the 15th year. A few *P. falciparum* remain in adult life, but gametocytes are very rare; in short, the condition, in adults, resembles that which exists in very young babies.

W F

SERGEANT (Edmond), SERGEANT (Etienne) & CATANEI (A). "Maisons à paludisme" et "instinct de retour à la pâture" chez les moustiques [**"Malaria Houses," and the "Hospice Return Instinct" in Mosquitoes.**].—*C R Acad. Sci.* 1933 Dec. 26 Vol 197 No 26 pp 1711-1713

Describes an experiment in which cages and canaries took the place of houses with their human inhabitants.

There are often houses in malarious places where fever recurs year after year while those around it remain comparatively free. It has been suggested that these "malaria houses" are such, firstly, because they contain a good infector and, secondly, because mosquitoes have an instinct which drives them to return, after depositing their eggs, to the place where they fed before.

The authors devised a method of testing this hypothesis by a practical experiment, in which cages represented houses, the inhabitants were canaries, and the breeding-place for mosquitoes was a tub nearby. In one cage, known as "Maisonette à virus" were two canaries, one of which was infected with *P. relictum*, while the other was healthy; in the other cage, known as "Sans virus," were two healthy birds. The maisonettes and the breeding pool were isolated by mosquito gauze, but two gauze tunnels, several metres long, led up from the pool, one to each maisonette, and up these tunnels *Culex pipiens* came to feed on the canaries. If the hospice return instinct played a part, the mosquitoes which had become infected in "Maisonette à virus" would have returned there after depositing their eggs in the pool, and would have infected the healthy bird which shared quarters with the one which was infected. At the same time, only the mosquitoes which had fed in "Sans virus," on its healthy inhabitants, would return to feed there again and consequently this maisonette would remain free from

infection. This did not happen; the mosquitoes did not always return for their second meal to the place where they had enjoyed their first. The apparatus was duplicated and the experiment was repeated several times, with the result that 17 canaries were infected in the "maisonette à virus" and 18 in the "maisonette sans virus". Some other explanation of "malaria houses" must be looked for. *W F*

HIMMELSBACH (C K) **Malaria in Narcotic Addicts at the United States Penitentiary Annex, Fort Leavenworth, Kans.**—*Public Health Rep* 1933 Dec 8. Vol 48. No 49 pp 1465-1472

The author reports another series of cases in which malaria was carried from drug-addict to drug-addict by means of the syringe [see FAGET, *ante*, p 164].

This series comprised 28 inmates out of 1,596 at the United States Penitentiary Annex, Fort Leavenworth, Kans. In 8 cases there was fair proof of needle transmission, in 6 it was possible, and in 14 the malaria was recurrent or unexplained. The sharing of "shots," the lack of sterilization, and the use of the intravenous route by the donor seem to be essential conditions for transmission. Several of the cases appear to have attended morphia inoculation parties in the gaols from which they were transferred to the penitentiary. *W F.*

RODHAIN (J) Notes cliniques sur la malaria chez les Européens rentrant du Congo Belge. [**Malaria in Europeans returning from the Congo.**]—*Ann. Soc Belge de Méd Trop* 1933 Dec. 31. Vol 13 No 4 pp. 421-427. With 1 graph

A case of *P. ovale* infection, and a case of congenital malaria.

The author has met with several cases where pregnant women have jeopardized their lives by stopping their prophylactic quinine through fear of abortion. He gives details of such a case, with a mixed infection of *P. ovale* and *P. falciparum*. He also describes a case of latent congenital malaria. A lady from the Congo had an attack of benign tertian on the day after her confinement in France on April 24. The author examined the baby's blood on June 27 and was surprised to find benign tertian parasites—not only because the baby had never been in a malarious country, but because it had no fever or signs of malaria.

W. F.

BOYD (Mark F.). **Observations on Naturally Induced Malaria.**—*Southern Med. J.* 1934 Feb Vol. 27 No. 2 pp. 155-159.

The author reviews the observations on induced malaria which he made at the Florida State Hospital, particularly as regards the resistance of negroes to infection (see this *Bulletin*, Vol. 30, p 852, and *ante*, p. 166).

Patients were therapeutically infected with four local strains of *P. vivax* by the bites of *A. quadrimaculatus*. The author considers that white patients who are not harbouring a latent infection are invariably susceptible, and that failures are due to deficiencies of the sporozoites. In 103 primary inoculations of white patients, there were only 16 failures, and 12 of these were bitten a second time without a single failure. Negroes are almost insusceptible; of 14 inoculated, none became ill, and only 5 had transient parasites in the blood. In order

to determine if this immunity is acquired or racial, a negro child, five years old and free from malaria, was exposed to the bites of infected mosquitoes. The child remained uninfected although white patients bitten by the same mosquitoes contracted malaria. The density of parasites in the blood at the *beginning* of a clinical attack is the best means of distinguishing a primary attack of benign tertian from a recurrence; in a recurrence, the parasites are more numerous and the spleen may be enlarged. When the attacks have been allowed to progress for some time they are singularly amenable to quinine. Infection with *P. falciparum* has been employed in a few cases in order to make malaria therapy available to negro patients. Negroes possess an appreciable resistance to this species of parasite, but it is far less than the resistance to benign tertian. Limited experience with quartan malaria suggests that it is unsuitable for naturally induced malaria therapy, largely because the supply of infected mosquitoes cannot be frequently renewed. Judging from the few cases inoculated, negroes, as well as whites, appear to be highly susceptible.

The extrinsic incubation periods in the mosquito, at 20°C. were: benign tertian, 17 days; subtertian, 23 days; quartan, 35 days. The intrinsic incubation periods in the patients depended upon the dose of sporozoites injected. They were: in benign tertian, about 15 days; subtertian, 11 days; quartan, 27 to 42 days. Gametocytes appear in benign tertian, from the onset of fever, in subtertian, about the end of the first week, in quartan, after several months. The gametocytes in benign tertian are more abundant in the primary attack. *W. F.*

LOWE (John) **Studies in Untreated Malaria.**—*Indian Med. Gaz.* 1934. Jan. Vol. 69. No. 1. pp. 16-23. With 4 charts.

Sixteen cases of benign tertian were left untreated. Eleven were arrested spontaneously in about a week. Subtertian could not be left without treatment for longer than 48 hours. The stages of fever in benign tertian resembled those described by JAMES, but the onset of quotidian fever was more sudden.

The author studied the course of fresh *P. vivax* infection in 37 inmates of the Leprosy Hospital, Dichpali, Hyderabad, who had not suffered from malaria for a year or more, but who had probably been infected at some period in their lives, because they lived in a country where malaria was endemic. JAMES has found, in primary infections with *P. vivax*.—(1) An initial stage of subcontinuous, or remittent, fever lasting 2-5 days, with several crops of parasites maturing at different times. (2) A developed stage of quotidian intermittent fever with rigors, associated with two crops of parasites and lasting about 10 days. (3) A terminal stage, characterized by tertian fever, which develops when one of these crops dies out. In relapses and second attacks he found that the fever was tertian from the beginning. In the author's series JAMES's initial stage was missing, the fever began as intermittent quotidian with rigors, associated with two broods of parasites in the blood. None of the series passed on to JAMES's third, or "developed stage" of tertian paroxysms, because they either cleared up spontaneously, or were given quinine, before it was reached. When relapse occurred, the fever was always tertian, as noted by JAMES. The absence of JAMES's initial stage of subcontinuous fever is ascribed by the author to former attacks of malaria in the distant past. JAMES found that in reinfections the fever—like that of the relapse—was

tertian from the beginning, but, JAMES's reinfections occurred within 5 months of the first infection, whereas the first infection in the author's cases had occurred years before.

Sixteen cases were left untreated. Spontaneous arrest took place in 11 of these, after an average period of 6 days, in the remaining 5, quinine was given after a few days because the patients were distressed. There were 2 relapses which subsided spontaneously among the 11 untreated cases, there were no relapses, within a period of 6 months, among the remaining 29 who were given cinchona febrifuge 24 grains daily for one week, followed by 12 grains daily for a second week.

Twenty-one cases of subtertian were investigated. They began more gradually, without the sudden onset and rigors of benign tertian. Soon there was some collapse and vomiting and in all cases it was necessary to give quinine after 48 hours, if not before. The temperature was remittent, but never normal, because sporulation was continuous.

W. F.

LEAGUE OF NATIONS HEALTH ORGANISATION **Malaria Commission.**
Ten Years of Activity of the Commission.—C.H /Mal /212 29
mimeographed pp Geneva 1934 Mar 1

An interesting synopsis of the work of the Commission.

"In the history of malaria, too often the study of a definite problem in a country has led to general conclusions which have later proved altogether inapplicable to other countries. The Malaria Commission has been aware of this fact since its very beginning and has always stressed the importance of co-ordinated international research."

Poverty and starvation, the migration and mingling of races, and the disorganization of public health services, were the cause of a tremendous increase in malaria during and after the war. In Italy, the mortality from malaria before the war was 60 per million, but by the end of it, this figure had risen to 320, and only fell to the pre-war level five years later. The malaria morbidity in Russia had never risen above 3,500,000 before 1914, but in 1923, it was 13,500,000. A similar increase occurred in other parts of the world, and the disease reappeared in some countries which had been free from it for many years. Under these conditions, the malaria problem became a serious medico-social question and offered an excellent opportunity for international assistance. A Sub-Commission composed of six expert malariologists was set up in 1923 by the Health Committee of the League. The size of the Sub-Commission, now called the Malaria Commission, grew gradually until to-day (1933) it consists of 7 members who are also members of the Health Committee, and of 47 experts and corresponding members. The first problems which came before the Commission were (a) anophelism without malaria, (b) the production and sale of quinine; (c) epidemiological enquiries in a number of heavily infected countries. The Commission decided to undertake tours in connection with these investigations. During the first tour, which was made in 1924, information was collected in Bulgaria, Greece, Italy, Rumania, Russia and Yugoslavia; in the following year Spain and Palestine were visited; in 1926, Corsica and Sicily, in 1927, the United States; in 1929, India. In Sicily, "the development of '*bonifica*' works and the improvement of economic conditions, combined with the treatment of cases, showed the value of the '*bonifica integrale*' which has nowhere succeeded as well as in Italy, thanks to the close collaboration of the

Government. As a result of this work two-thirds of the soil of the island which had previously been submerged was rendered useful for agriculture."

The experience gained by the Malaria Commission now allows them to help countries which ask the League of Nations to assist in the reorganization of public health. For example, a member of the Commission made a malaria survey of Siam in 1931, and his recommendations were communicated to the Siamese Government.

The Commission have collected information concerning the prevalence of malaria throughout the world. Ninety-three health administrations, representing three-quarters of the population of the world, replied to an inquiry on this question, and, from their replies, it appeared that some 18 million people were treated for malaria in one year. This did not include countries such as China and Brazil, for which figures were not available and it followed that the real number was much larger.

An analysis of the factors determining the epidemiology of malaria, and a study of the various methods of antimalaria work, enabled the Commission to establish a number of principles as regards antimalaria work in Europe. It was agreed that before any method was decided upon, it was, in the first place, essential to treat the sick, then to kill the malaria parasite, either by treating the patient, or by slaughtering the mosquitoes in the houses.

International courses of instruction in malariology have been organized under the auspices of the League since 1926. Theoretical and laboratory work occupy the first month of the course, and are followed by two months field work in a malarious country. Scholarships are granted by the League, by the Rockefeller Foundation, and by health administrations. The conditions affecting malaria in the tropics differ from those in Europe, and the Malaria Commission has therefore organized a course of instruction in Singapore which will be followed by field work in one of the neighbouring tropical countries. The first course begins on April 30, 1934. Individual scholarships have been given to malariologists in various countries, in order to enable them to see the antimalaria work which was being done in other places.

A meeting was held at Geneva in June 1928, attended by the leading malariologists of the world, at which it was decided that the following problems warranted international co-ordinated research: (1) Treatment and its importance in prophylaxis; (2) Housing, biology of anophelines in connection with shelters; the influence of different factors upon the biology of anophelines and upon epidemiology; (3) Anophelism without malaria, and malaria in deltas. As the result of their enquiry into the consumption of quinine the commission recommended a standard formula for a mixture of the total alkaloids of cinchona, known as totaquina (this *Bulletin*, Vol. 29, p. 461, Vol. 30, p. 477); trials of this product have been made in a number of countries and a report will appear shortly. Plasmoquine-quinine and quinio-stovarsol have also been investigated under the auspices of the Commission.

A general report on the therapeutics of malaria, based upon controlled experiments made in connexion with the malaria-therapy of mental diseases was published by the Commission in 1933 (this *Bulletin*, Vol. 30, p. 837). The question of anophelism *sine* malaria has been investigated especially in the deltas of the Danube, Ebro, Po and Rhine (*ante*, CANTACUZENE *et al* and SWELLENGREBEL, p. 162) and

several reports have been published, in which it has been shown that when the equilibrium of conditions in a delta is disturbed by building or agricultural developments, malaria may follow. Reports have also been published in connexion with Housing in Relation to Malaria (*ante*, CHRISTOPHERS & MISSIROLI, p. 158) W F.

SERGEANT (Edm. & Et.), PARROT (L.) & DONATIEN (A.). *Prémunition et immunité dans le paludisme et dans d'autres maladies. [Premunition and Immunity in Malaria and Other Maladies.]—Trans. Roy. Soc. Trop Med & Hyg 1933 Nov 30 Vol. 27 No 3 pp. 277–280.*

A note on premunition apropos of Professor J. G. THOMSON's paper [this *Bulletin*, Vol 30, p 827]

The authors proposed the term "premunition," in 1924, to indicate a particular form of immunity characterized by a *tolerance* of the host's tissues with regard to the virus with which it is chronically or latently infected, and also a *resistance* of the host to fresh infection with regard to that virus. This resistance is contemporaneous with the latent infection, and ceases when it is cured. Premunition is a co-infective state, but immunity is a post-infective state. Premunition is not limited to plasmodial infections, but occurs also in infections with *Brucella*, *Bartonella* and syphilis. CALMETTE adopted the word "premunition" to define the resistance conferred by his vaccine B.C.G. Premunition is sometimes followed by immunity and several examples of this are given in connexion with the infection of animals with *Trypanosoma maroccanum*. W F

KLIGLER (I. J.) & MER (G.). *The Development of Immunity against Malaria in Children under Ten Years of Age.*—*Trans Roy. Soc Trop Med & Hyg 1933 Nov 30 Vol 27. No. 3. pp. 269–276* [16 refs]

Children acquire very little immunity to malaria until they are over 6. Children should be used for testing antimalaria drugs.

Children in a hyperendemic area constitute the greatest reservoir of parasites. A drug which is therapeutically efficient for adults may be much less useful for children. Young animals do not develop immune bodies readily. They succumb sooner to experimental infection than older animals: *e.g.*, paratyphoid epidemics among guinea-pigs, trypanosomiasis in rats and mice, and amoebic infection in cats. Young animals have less complement in their serum; they elaborate fewer antibodies, and these more slowly, than old ones. The authors carried out continuous observations over a period of two to three years on 95 children living in the hyperendemic area of Huleh, in Palestine. They found that the percentage of children infected did not decline until the sixth year was reached, though the intensity of infection was less after the fourth year of age. The observation of CHRISTOPHERS and others, that two years residence in a hyperendemic area confers immunity, does not apply to children. Children relapse more quickly after treatment, and they give a higher reinfection rate. Antimalaria drugs should be tested on children under six years of age, in order that the efficiency of the drugs may be judged apart from the complications introduced by the immunity of the host. W F.

GILL (C. A). **Immunity in Malaria.**—*Trans Roy Soc Trop. Med & Hyg* 1933 Nov. 30 Vol. 27 No 3. pp. 281-284

The author discusses several points raised by Professor J. G. THOMSON in his paper on Immunity in Malaria [this *Bulletin*, Vol 30, p 827] He also criticizes the application of knowledge gained during the treatment of general paralysis by malaria therapy to the problems of immunology and epidemiology For example, JAMES has been led to conclude, on the basis of such experimental transmissions, that each species of malaria parasite embraces numerous strains possessing varying antigenic properties (*tom. cit*, p 76) These somewhat startling conclusions are difficult to reconcile with observations made in India. In JAMES's experiments the subjects were not normal individuals but syphilitics Secondly, they may have had numerous drugs administered to them, such as arsenical preparations, sedatives and hypnotics, whose influence upon the malaria parasite is unknown. It has been found in Rangoon that patients with general paralysis are refractory to infection and cannot easily be reinfected. It is questionable whether experiments on such patients should be regarded as clean experiments
W. F

ROUBAUD (E.). Le point de vue anophélien dans l'anophélisme sans paludisme, en Europe. [**The Anopheline Standpoint in Anophelism without Malaria.**]—*Bull Soc. Path. Exot* 1933 Dec 13 Vol. 26 No 10 pp. 1215-1233 [11 refs]

A masterly review of the theory of zoophilous deviation by its author

The author was presented with the Laveran gold medal of the Société de Pathologie Exotique, in the presence of Mme A LAVERAN, at a meeting held on December 13, 1933. He subsequently read this paper in which he reviews the question of anophelism without malaria and cites much of the work which has been summarized in this *Bulletin* [see Vol. 30, p 833 for references] He does not hold the view, sometimes attributed to him, that the mere presence of numerous domestic animals is sufficient to produce zoophilic deviation of anopheles.

He began, by referring to the many parts of Europe which, though malarious in the past, have become healthy in spite of the persistence of great numbers of anophelines. Though these anophelines readily convey malaria under experimental conditions, they do not do so in the field, and though many cases of malaria were repatriated into such districts at the end of the war, the slight outbreaks of malaria which resulted soon died out, and the disease did not become endemic. There is some natural barrier against the spread of malaria in these areas. The author commenced his work on the problem in 1919, in Corsica. *Anopheles maculipennis*, the chief European carrier, has a distribution extending from latitude 30°, which is south of the Mediterranean, to latitude 65°, which is within the arctic circle. It is present not only in the unhealthy regions, but also in the healthy. There exists, however, an important biological difference between the races occupying these different regions; those in the unhealthy districts prefer to feed on man, while those in the healthy districts prefer to feed on animals. C. WESENBURG-LUND, at about the same time as the author and working independently in Denmark, arrived at the same

conclusion that anophelism without malaria was due to the misanthropy of the anopheline population.

The author has studied, in the insectarium, 15 strains of mosquitoes sent to him by aeroplane from different parts of the world, and he has been able to divide them into two classes by their feeding preferences. Three strains, one from the Pontine Marshes, one from the south of Spain, and one from Algiers, preferred to feed on man, all the other strains were zoophilous. The androphilous races have a more feeble maxillary armament ("paucidentate") than the zoophilous, and therefore cannot pierce the thick skins of animals so easily. The author also refers to the differences in the eggs of the different races [see VAN THIEL, this *Bulletin*, Vol 30, p 831]. He then passes on to consider the work of the Dutch investigators. In Holland, there used to be two malaria seasons, one in the spring and another, more severe, in the autumn, but, to-day, the autumn epidemic does not occur, only the spring epidemic remains, and it has been shown that this is due to infections contracted during the late autumn and winter, from the bites of mosquitoes which have sheltered in human habitations during the cold months. The severe autumn epidemics which occurred a few generations ago have disappeared because, during the summer, the mosquitoes feed on animals. The artificial warmth of the houses in winter is sufficient to permit the development and transmission of benign tertian parasites by the mosquitoes which chance to shelter there, but it is not sufficient for the transmission of *P. falciparum*, and consequently malignant tertian has disappeared from northern Europe. Only one (*atroparvus*) of the two races of *A. maculipennis* found in Holland carries benign tertian during the winter. Though it feeds repeatedly, its eggs do not develop until the spring. The other race is larger and stores up fat in the autumn which enables it to hibernate out of doors without feeding during the winter. If it is kept in a warmed room during the cold weather, it will continue to feed like *atroparvus*, but if it feeds, its eggs develop and it is killed by the cold when it flies out to deposit them. *Atroparvus* breeds in brackish water, and in those parts of Holland where there is no brackish water there is neither *atroparvus* nor malaria. Both the Dutch races of anophelines are zoophilous, and there are parts of France, such as the vast marshes of the Vendee, where *atroparvus* is present, but does not attack the inhabitant unless the number of animals is much reduced.

Will the mere introduction of domestic animals into a malarious district be sufficient to make it healthy? The author replies in the negative. Malaria is prevalent in many parts of southern Europe where cattle are abundant, deviation by cattle is almost entirely limited to the colder countries in the north of Europe. It is not merely a matter of temperature—zoophilous deviation is present in certain parts of Italy—but rather of the way the animals are housed. In the north, the animals are housed in closed buildings which protect them from the cold; but in the south they are left in the open, or kept in open shacks. The anophelines are more readily deviated by the animals in the closed buildings, for the insects do not feed readily except under shelter. The northern European has seen malaria disappear from agricultural districts, not because of his colder climate, or because of better hygiene, but because he houses his animals better than his brother in the south. Permanent stables are the first condition of prophylaxis by animals through selection of zoophilous races. Other factors are tilling of the soil and drainage, by which floods are prevented

and the proportion of mosquitoes to animals is kept constant. Men must not sleep under the same roof as their animals—a practice which is too frequent in poor countries.

The development in Europe of a state of anophelism without malaria, based upon the selection of zoophilous races of anopheles, implies a complex of influences far more involved than the multiplication of animals. Our men of the soil, by unremitting toil to improve the lot of man and beast, have unwittingly succeeded in a vast experiment, which consisted in nothing less than fixing and stabilizing the zoophilous preference of the anopheline fauna. W. F.

VAN THIEL (P. H.). *Waarom is het voorkomen van malaria in Nederland tot enkele streken beperkt?* [**Why is Malaria in Holland confined to Certain Districts?**—*Nederl. Tijdschr. v. Geneesk.* 1934 Mar 3 Vol 78. No 9 pp. 997-1007 [Refs in footnotes] English summary.]

The author argues that the density of the anopheles population, especially in August, should be taken into consideration, in addition to differences in the hibernation of the large- and small-winged races of *A. maculipennis*, in order to explain the phenomenon of anophelism without malaria in Holland. He also states that the spring peak of malaria is probably due, at least in part, to the efflorescence of latent infections acquired in the previous July or August, and not in the late autumn, as is generally supposed. [See WEYER, above.] W. F.

MENON (T. Bhaskara) & ANNAMALAI (D. R.). **Nephrosis in Malaria.**—*Jl Trop. Med. & Hyg.* 1933 Dec 15 Vol 36. No. 24. pp. 379-381 With 3 figs

A description, with photographs, of the diseased kidneys of a woman infected with malaria, who was found in a dying condition.

A Hindu woman was picked up unconscious in the street and brought by the police to the hospital where she died before a clinical examination could be made. Spleen smears showed malaria pigment arranged in small clusters and rings inside the blood cells and endothelial cells, an appearance which is commonly met with when an examination is made some time after death from malaria. The kidneys were much enlarged and there were degenerative changes in the tubules with only slight changes in the glomeruli. The epithelium of the convoluted tubules was necrotic and formed casts. Clusters of neutral fat globules and doubly refractive fat were present. "The presence of malarial pigment in the epithelial cells of the proximal convoluted tubules raises the interesting possibility that this is the hypothetical toxin that is responsible for the nephrosis." W. F.

CAROTHERS (J. C.). **An Investigation of the Etiology of Subacute Nephritis as seen among the Children of North Kavirondo.**—*East African Med. Jl.* 1934 Feb. Vol. 10. No. 11. pp. 335-336.

Numbers of cases of nephritis associated with anasarca are admitted to Kakamega Hospital. The incidence of subtertian malaria and of intestinal parasites proved to be the same in these cases as in patients who were suffering from other diseases, but 67 per cent. of the nephritic children were suffering from quartan malaria, while the rate among

other children was only 8 per cent. Subacute nephritis has occurred in 36 per cent. of all cases of quartan malaria admitted [see this *Bulletin*, Vol 27, p 508, Vol 28, p 131].

W F

LANDEIRO (Fausto). Splénographie et expression algébrique des splénogrammes [**Splenography and the Algebraic Expression of Splenograms.**]*—Arquivos Inst Bact Camara Pestana* 1933. Vol. 7. No 1 pp 101-112 With 15 figs

The author's splenograph is a lattice-like instrument, on the principal of "lazy-tongs," or of the apparatus which used to be advertised for tracing enlargements of photographs. In order to chart a spleen, he first marks out its limits on the patient's abdomen with a grease pencil. He then goes over this line with the pointer on the long arm of the splenograph, and, while he does this, a pencil at the end of the short arm reproduces this outline, a fifth of the size, on squared paper. The number of the squares multiplied by five equals the size of the spleen in square millimetres. The index of splenic reduction proposed by the author is as follows:—

$$\text{Irs} = \frac{\text{rs}}{\text{d}} = \frac{(\text{A1} - \text{A2}) \times 5}{\text{d}}$$

A1=Number of squares enclosed by outline on the splenogram at the first observation.

A2=The same at the second observation.

d=Number of days between the two observations.

Irs=Index of splenic reduction

W F

MACKAY (R). **A Note on Congenital Malaria.***—East African Med. Jl.* 1933. Nov. Vol. 10. No 8 pp. 246-249.

Blood-films were prepared from the severed ends of the umbilical cord and from the infant's heel, by the sister-in-charge, in 22 maternity cases. *P. falciparum* was never found in blood from the foetal end of the cord, it was found 3 times in blood from the maternal end, and 7 times in blood from the infant's heel. Unrecognized infection may account for many deaths in early infancy.

W. F.

- i JOHNSON (P. D) **Treatment of Malaria in Europeans by Atebrin with Special Reference to the Relapse Rate.***—Brit. Med. Jl.* 1934. Mar. 17. pp. 473-477. With 2 figs.
- ii MACMAHON (E. J R). **Treatment of Malaria with Atebrin.***—Ibid.* pp. 477-478.
- iii. FRANKLIN (E. Morris). **Malaria in a European treated by Atebrin by Mouth and Intramuscularly.** [Memoranda]*—Ibid.* pp 482-483.

i Atebrin is superior to quinine. The relapse rate in Asiatics is 5 to 10 per cent., in this series of Europeans it was 43 per cent. The toxicity of plasmoquine is enhanced by combination with atebrin.

Forty-nine cases of malaria (29 B.T.; 17 M.T., 3 mixed) in Europeans were treated in Batu Gajah Hospital (F.M.S.) with atebrin in tablets of 0.1 gram three times a day for adults and in smaller quantities for children. The children took the drug well; one baby of 8 months was given 0.1 gram daily, without ill effects. Atebrin caused no tinnitus or deafness, and patients were unanimous in preferring it to quinine. The

shortness of a course of atebtrin treatment was another point in its favour, as was also the absence of the vomiting which sometimes follows quinine. A patient in whom quinine produced urticaria and asthma was able to take atebtrin with impunity. The administration of larger doses of atebtrin, or the prolongation of the course beyond 5 days, had no apparent advantage. The duration of fever and parasites in Asiatics under treatment with atebtrin is about 15 hours less than in Europeans. This is probably due to the greater immunity of the Asiatics. The relapse rate in Asiatics after atebtrin treatment is 5 to 10 per cent, but, in this series of Europeans, 43 per cent relapsed within 6 months, and the author considers that the claims of atebtrin have been exaggerated in this respect. No toxic symptoms were observed while the patients were in hospital, but 6 suffered from pain in the epigastrium after their discharge, it was unassociated with vomiting, but was intensified by food. These symptoms were severe in two cases, but they yielded to treatment with milk and alkalis in a few days. Plasmoquine was not given with the atebtrin, but several patients were admitted to hospital suffering from abdominal pain, vomiting, and cyanosis as the result of treatment with this combination in their own homes. The doses of plasmoquine do not appear to have been large, and the author thinks that it is more toxic in combination with atebtrin than when it is given by itself [*ante*, pp. 168 and 169].

ii. Dr. E. J. R. MacMahon gives an account of 50 cases of malaria in Trinidad treated with atebtrin and plasmoquine compound. He states that, "any complications arising as the result of treatment were, I am convinced, due to the use of plasmoquine compound."

iii. Dr. E. Morris Franklin describes a case of severe subtertian infection admitted to the European Hospital at Accra. Atebtrin 0.1 gram three times a day was prescribed, but, as there was no improvement after about 44 hours, the patient was given 0.1 gram of atebtrin by intramuscular injection twice during the third day and once on the fourth, the oral doses were continued in the meantime. Improvement followed the first injection almost immediately [possibly due to the atebtrin already given by the mouth] and was uninterrupted. W. F.

MANWELL (Reginald D.). **Effect of Atebrine on Avian Malaras.**—*Proc. Soc. Experim. Biol. & Med.* 1933 Nov. Vol. 31 No. 2 pp. 198–199.

Atebtrin acts differently in different kinds of bird malaria.

Atebtrin was given orally to female canaries for 7 to 9 days. The dose was 2 mgm dissolved in 100 cm [*sic*] of water twice a day. Birds were infected with *Plasmodium rouxi*, *P. circumflexum*, and *P. cathemerrum* by blood inoculation. Some birds were treated during the incubation period, and others during the acute stage. Atebtrin appeared to be a perfect specific against *P. rouxi*, but it was not possible to cure or prevent infection with the other two species. [See this *Bulletin*, Vol. 29, p. 710.] W. F.

MANWELL (Reginald D.). **Quinine and Plasmochin Therapy in Infections with *Plasmodium circumflexum*.**—*Amer. J. Trop. Med.* 1934. Jan. Vol. 14. No. 1. pp. 45–59. [24 refs.]

Related species of parasites respond differently to chemotherapy and each species may require a separate drug for effective treatment.

Plasmodium circumflexum was first described by KIKUTH, in 1931. The average incubation period after the intramuscular inoculation of canaries was 8.6 days, it varied with the dose. The average duration of the acute period was about a week, the mortality was higher than in *P. praecox* infection and equal to that of *P. cathemerium*, 25 per cent of the birds died. Relapse is common during the first 6 weeks of the chronic stage, and is often fatal.

Treatment with quinine or plasmoquine during the incubation period will prevent the onset as long as it is continued, sometimes it will abort the infection altogether, but usually the attack comes on when the drug is stopped. Treatment during the acute stage is less effective, plasmoquine quickly clears the peripheral blood, quinine is relatively ineffective, but neither of them sterilizes the bird and relapses are common. The combination of quinine with plasmoquine does not strengthen the action of the latter.

"The susceptibility of the five species of avian plasmodia here considered to treatment with quinine and plasmochin appears to be as follows, the most susceptible being given first"

Quinine	Plasmoquine.
1 <i>P. rouxi</i>	1 <i>P. elongatum</i>
2 <i>P. praecox</i>	2 <i>P. rouxi</i>
3 <i>P. cathemerium</i>	3 <i>P. praecox</i>
4 <i>P. circumflexum</i>	4 <i>P. circumflexum</i>
5 <i>P. elongatum</i>	5 <i>P. cathemerium</i>

W. F.

MANSON-BAHR (P. H.) & WALTERS (A. H.) **Selective Action of Atebrin and Plasmoquine upon the Subtertian Malaria Parasite (*Plasmodium falciparum*)**—*Lancet*. 1934 Jan 6 pp 15-16

The action of atebrin and plasmoquine carefully observed by means of blood culture and the wet coverslip method.

An Indian, aged 24, suffering from malaria, had 1,870 male crescents, 3,190 female crescents, and 1,100 ring forms per cmm of blood. His blood was examined daily, and cultures were made by Sinton's method. He was given 0.3 grams of atebrin daily for 5 days. On the first day of treatment no changes were seen in the ring-forms and they developed in cultures, but on and after the second day there was no development in cultures. Within four days all rings had disappeared from the blood, but the crescents were unaffected and, on the moist slide, the females became rounded and the males exflagellated as readily on the fifth day as on the first. For the next five days, 0.04 grams of plasmoquine were given daily. The effect of this on the crescents was very rapid; on the second day, after 0.08 grams ["0.8 g." in the paper, an obvious misprint] had been taken, the wet coverslip method showed a complete inhibition of the female gamete, and a curious partial inhibition of the male, which rounded and showed internal activity as usual, but failed to proceed to exflagellation. On the third day of plasmoquine treatment, the crescents appeared quite inert. On the fourth, they were scanty and showed irregularity in outline and staining. On the fifth, none could be found. [The senior author was the first to draw attention to the action of plasmoquine in preventing exflagellation [see this *Bulletin*, Vol 25, p 564].]

W. F.

HAYDEN (Reynolds) **The Use of Plasmochin in Malaria to prevent Relapse.**—*U S. Nav Med Bull* 1934 Jan Vol 32 No. 1. pp. 19–20.

Marines who had returned from the tropics with malaria were treated at the Marine Barracks, Quantico, Va. In the presence of a hospital corpsman, 72 were given 10 grains of quinine daily for 8 weeks, except on Sundays, with the result that 17 of them had recurrences towards the end of the course, or soon afterwards. A second batch of 53 men were given 2 centigrams of plasmochin daily for the two first weeks of the quinine course, except on Sundays, with the result that only 3 relapsed. [The simple test for quinine absorption, by adding a few drops of Mayer's solution to the urine, was omitted.] *W. F.*

RUSSELL (Paul F) **Plasmochin, Plasmochin with Quinine Salts and Atabrine in Malaria Therapy.**—*Arch. Intern Med* 1934 Feb. Vol. 53 No 2 pp 309–320. [40 refs.]

This is a review of papers which have been published on the subject of plasmochrome and atabrine, with 40 references. Plasmochrome is sold in the following forms —

Plasmochrome simplex. tablets containing 0.02 gram, or 1/3 grain plasmochrome hydrochloride.

Plasmochrome compound. tablets containing 0.01 gram, or 1/6 grain, of plasmochrome hydrochloride and 0.125 gram, or 2 grains, of quinine sulphate.

Quinoplasmine, Beprochin, or Plasmochrome with Quinine Salts. tablets containing 0.01 gram, or 1/6 grain, of plasmochrome hydrochloride and 0.3 gram, or 4½ grains of quinine sulphate. *W. F.*

MASSIAS (Charles) **Le 710 et le 574 associés au quiniostovarsol dans le traitement du paludisme [Treatment of Malaria by 710 and 574 together with Quiniostovarsol.]**—*Bull Soc Méd-Chirurg Indochine*. 1933 June. Vol. 11. No. 4 pp. 377–385. [22 refs.]

It is claimed that both drugs, in combination with quiniostovarsol, act upon all forms of benign and malignant tertian parasites, including crescents [see SICAULT and DECOURT, below].

Ten patients were given 0.08 gram of 710 with 1 gram of quiniostovarsol daily, in two doses. Each course lasted 7 to 10 days, with 7 days interval between them. The action on both *P. vivax* and *P. falciparum* was very rapid. Crescents disappeared in a few days. The drug 710 should be in the form of tablets. The powder changes rapidly and becomes toxic. The tablets should be kept in the ice-chest, away from the light.

The author treated 52 cases with 574 and stovarsol. This drug, 574, is more stable; the author has kept cachets for 8 months. No toxic symptoms occurred even when the full dose of 0.08 gram of 574 with 1 gram of quiniostovarsol was given daily for 10 days. The drug acted quickly upon the parasites of benign and subtertian malaria. The author states that he has not yet seen a case in which the gametes of *P. falciparum* have resisted 574. [It is difficult to decide how much was due to the quiniostovarsol, and how much to the other drugs.] *W. F.*

SICAULT (G) & DECOURT (Philippe) Observations sur 17 paludéens traités par le 574 F [Seventeen Cases of Malaria treated with 574 F.].—*Bull Soc Path Exot* 1934. Feb. 14 Vol 27. No 2. pp. 144-146

The authors treated a series of cases with 574 in 1932, but they found that it did not destroy the crescents. They therefore, in 1933, employed larger doses, varying from 0.7 to 2 milligrams for each kilogram of body weight [0.047 to 0.128 gram for a man weighing 10 stones]. Toxic symptoms were produced by these larger doses, and it became necessary to stop the treatment in 7 out of 17 cases. The drug was active against the different forms of parasites, including crescents, but did not prevent speedy relapse [See this *Bulletin*, Vol. 30, pp. 200, 479, 850] W. F.

WILLIAMS (C. D.). Quinine in the Treatment of Malaria in Children.—*Gold Coast Rep. on Med. Dept. for Year 1932-33*. Appendix 9. pp 99-104; and *West African Med. J.* 1933. Oct. Vol. 7. No. 2 pp. 105-108

"So much has been written lately about the newer drugs that there is some danger that we may lose sight of the excellence of quinine."

During the years 1931 and 1932, 11,519 cases of malaria were treated at the Princess Marie Louise Hospital for children, Accra, Gold Coast. Accra is comparatively free from mosquitoes, and most of the infections were contracted outside the town. There were 13 deaths among 1,170 children admitted as inpatients. The commonest age for malarial attacks is between 2 months and 3 years. Splenomegaly reacts magically to quinine in young children. Enormous spleens are comparatively rare. Cachexia is uncommon. The most fatal of all types of malaria are those in which the subjects have become profoundly anaemic. A prompt transfusion gives the best chance of success. If the patient does not die from anaemia in the first 24 hours after admission, recovery is almost certain. Anaemic children are treated with iron, arsenic and liver juice in addition to quinine. Severe malaria cases are given 6 grains of intramuscular quinine immediately, almost irrespective of age or size. In the last three months, 300 injections have been given with only two abscesses. W. F.

ANALYST. 1934 Mar. Vol 59. No 696 pp 179-180—**Evaluation of Quinine Excretion by Means of Mayer's Reagent.** [From the Annual Report of the Institute for Medical Research, F.M.S., for 1932.]

"Evaluation of Quinine Excretion by Means of Mayer's Reagent.—Mayer's mercuric chloride reagent is commonly employed in the course of malarial treatment to detect the presence of quinine in urine. In the course of some 1,300 recent examinations of urine Dr. J. W. Field has noted certain anomalies in connection with the test. In alkaline urine containing quinine there appears to be a critical concentration of the alkaloid, the level varying with the degree of alkalinity, below which there is no precipitation with Mayer's reagent. Above that concentration precipitation takes place, although to a less extent than in acid urine. The difficulty may be avoided by using Tanret's acid reagent (3 grms. of potassium iodide and 1 gm. of mercuric chloride in 20 ml. of glacial acetic acid, diluted with water to 60 ml.).

"The statement that Mayer's reagent precipitates albumin is, generally speaking, incorrect. From acid urines it precipitates albumin, but not

from neutral or alkaline urines. When quinine and albumin are both present the quinine alone is usually precipitated by the reagent, the amount of precipitate varying inversely with the concentration of the albumin. This uncertainty may be avoided by using Tanret's reagent, which invariably precipitates the albumin as well as the quinine.

"Preliminary filtration of urine is seldom necessary. Urates dissolve readily on the addition of tap water, and a deposit of phosphates disappears on the addition of acetic acid. Cloudiness due to bacteria may be prevented by the addition of a few drops of formalin, which does not interfere with the reaction.

"Tanret's acid solution is an excellent test reagent for albumin when alkaloids are not present, it is more sensitive than the heat test or the use of Haller's reagent, showing the presence of a trace of albumin in urine within a few seconds."

SERGEANT (André) & VOGT (P). Essais de traitement de la tierce maligne par le "915 Fourneau" ou Rhodoquine. [**The Treatment of Malignant Tertian with Rhodoquine U (Fourneau 915).**]—*Bull. Soc. Path. Exot.* 1933 Dec 13 Vol 26 No 10 pp 1255-1257. With 1 chart.

The results do not appear to have been very satisfactory. Speedy relapse and toxic symptoms frequently occurred.

Fourneau 915 is a product related to plasmoquine combined with stovarsol. MARCHOUX has found it useful in benign tertian when given in doses of 0.3 grams daily [this *Bulletin*, Vol. 30, p 850]. The authors treated 11 cases of malignant tertian with 0.4 or 0.45 grams a day for 5 or 6 days, but in these small doses the drug had little or no effect on the fever or the parasites. Twelve patients were given 0.6 grams daily, with the result that the temperature came down in a couple of days and the parasites—crescents as well as rings—disappeared within five days. But relapses soon took place; five relapsed within a week, and two more within a month, three suffered from vomiting. Some patients were able to take larger doses, two were given 1.05 grams a day without ill effects, but the larger doses did not prevent relapses. One patient who was given 0.9 grams daily had severe toxic symptoms which came on four days after the end of the course and continued for fifteen days.

W. F.

SICAULT (G.) & DECOURT (Philippe). Observations sur 25 paludéens traités par la rhodoquine (710 F). [**Rhodoquine (710 F.) in the Treatment of 25 Cases of Malaria.**]—*Bull. Soc. Path. Exot.* 1934. Feb. 14. Vol. 27. No. 2. pp 146-149.

Rhodoquine resembles plasmoquine in its action.

The authors employed this drug in Morocco in daily doses of 0.3 to 0.8 milligrams per kilogram of body weight, by the mouth (0.018 to 0.048 grams for an adult), with the result that all parasites, including crescents, disappeared from the blood in a few days except subtertian schizonts. When quinine was given in addition, these schizonts were destroyed. Relapses were not prevented. There were no toxic symptoms; and doses of 1.3 milligrams per kilo (0.08 grams for an adult) are now being given. Larger doses of 3.6 and 10 milligrams per kilo have been given, but they proved toxic [see this *Bulletin*, Vol. 30, pp. 84, 200, 478, 849, 850].

W. F.

SERGEANT (André) & VOGT (P) A propos de la rhodoquine (915 Fourneau). [**Rhodoquine Fourneau 915.**]*—C. R. Soc Biol* 1934 Vol. 115 No 14 p 1571.

The last two summaries concern two substances called Rhodoquine, one numbered Fourneau 915, the other Fourneau 710 Fourneau 915, also called Rhodoquine U, was used by Sergeant and Vogt, and must be distinguished from the ordinary Rhodoquine used by SICAULT and DECOURT, which is 710 The tolerated dose of the latter is 4-5 cgm, and the dose employed is about 3 cgm which is 20 times less than that of 915 [M FOURNEAU has kindly informed us that the makers used the name Rhodoquine for all the derivatives of quinolein having the same nucleus as plasmoquine, attaching a letter of the alphabet to the common name to indicate the different derivatives, but that to avoid confusion Rhodoquine U will henceforward be known only as 915 F, and the name Rhodoquine will be kept for 710 F] A. G. B

TARA (Stéphan). Sur l'emploi de la dihydroquinamine [**The Use of Dihydroquinamine in St. Barthélemy.**]*—Rev. Méd et Hyg. Trop.* 1933. Sept-Oct Vol. 25 No. 5 pp 246-255. With 1 chart

Interesting sidelights on the island and the cashew nut by an enthusiastic medical officer

The little French island of St Barthélemy lies near the Leeward Islands, although it is within the tropics its population of 3,000 is almost entirely white, they and their forbears have lived there since the island was occupied 300 years ago. In 1932, there were 62 births and 27 deaths among 2,200 white inhabitants. The only water is rain water which is collected in cisterns. There is one swamp, which dries up in the dry season. The only anopheline is "*Maculipennis albimanus*" (? *A. albimanus*). It bites only in the dusk of morning and evening, but never in the night, in the dark corners of a house, it will bite in the daytime. During the dry season it is unnecessary to use a mosquito net. There is very little malaria on the island, and it is nearly always imported, generally from Guadeloupe, consequently it is known as the "Guadeloupe disease." Occasionally one of these imported cases infects other members of his family and a small outbreak occurs which is limited to one household, other families living 200 to 500 metres away are not affected. The author gives an account of six cases. Two of these were small children who had never left the island, but there is no record of their blood examination or of the finding of malaria parasites. The other four patients were adults who had become infected outside the island. Crescents were found in two, and rings in one. The author found dihydroquinamine very efficacious; he administered it, diluted with water, by rectal injection. He does not say that this is the best method, but it was the one best suited to his practice, in the pursuit of which he had to climb mountainous paths under a tropical sun to reach his scattered patients. [The use of additional remedies and the paucity of blood examinations make his claim for dihydroquinamine unconvincing.]

There is an interesting note on the cashew nut tree. If the edge of a glass of spirits, wine, or beer is rubbed with a young leaf, the contents become highly intoxicating. Drinks doctored in this way are often

given to European visitors "à faire une plaisanterie" The cashew fruit macerated in rum, forms a pleasant but highly intoxicating drink. The shell of the nut contains a vesicant fluid with remarkable aphrodisiac properties W F

KROUCH (M) La chimiothérapie antipaludéenne Essais d'un complexe gaméticide (CG) en milieu rural tunisien [Trial of **Complexe Gaméticide (CG) or Gamétoxyl for Malaria in Tunis.**]—*Bull. Soc. Path. Exot* 1934. Feb. 14 Vol 27. No 2 pp 141-144

A drug containing quinine, arsenic and dihydroquinamine

This drug is made in two forms, ampoules for injection, and dragées for oral administration :—

A—Formula of CG for injection

Chlorhydrate de diéthanol dihydroquinamine uranyle	01 gm
Benzylène éthyl arsianilate de diéthanol dihydroquinamine	.. .. . 01 "
Chlorhydrate neutre de quinine	.. .. . 35 "
Uréthane	.. .. . 175 "
Solution glucosée à 25 c/o et phénolée à 10 o/oo q s	5 cc

B—Formula of CG. for dragées

Chlorhydrate de diéthanol dihydroquinamine uranyle	025 gm
Benzylène éthyl arsianilate de diéthanol dihydroquinamine	.. .. . 050 "
Ethylcarbonate de quinine	.. .. . 225 "

In a first test, 25 cases of benign tertian and 32 of subtertian were treated. The doses varied from 1 to 2 ampoules a day for 2 days or more, followed by 2 to 4 dragées a day for 4 days or more. The parasites disappeared in all the benign tertian cases, there were 26 successes and 6 failures among the 32 subtertian cases. Crescents disappeared in 2 to 20 days. In 13 cases of benign tertian and 20 of subtertian, under observation for 20 days to 4 months, there was only one relapse. Other trials were made with much the same results, in one, a group of 42 persons was given gamétoxyl as a prophylactic, and a second group of 41 was given 6 grains of quinine daily; the results were similar. [An ampoule of gamétoxyl contains about 5 grains of quinine, and a dragée contains $3\frac{1}{2}$ grains. It is difficult to decide whether the other constituents played any part in its specific action.] W. F.

TATE (P) & VINCENT (M) **The Action of Synthetic Quinoline Compounds on Avian Malaria.**—*Parasitology*. 1933. Dec. Vol. 25. No. 4. pp 411-427. [27 refs]

Plasmoquine proved superior to quinine in sterilizing canaries, and, given after inoculation of malaria, it greatly prolonged the incubation. R.25 and R.36 resemble plasmoquine. Plasmoquine mixed with blood in vitro produces methaemoglobin.

The drugs were tested on female German roller canaries infected with *P. relictum* by direct blood inoculation. Forty-eight per cent. of the untreated birds showed parasites by the fifth day, or sooner, and 99 per cent. before the tenth day. The parasites increased until about the tenth day and then decreased until the birds went into the chronic state with less than one parasite per field, on about the seventeenth day. The mortality was only about 2 per cent. Only 2 untreated birds relapsed out of 21 observed for long periods. Birds with chronic

infections were not susceptible to re-inoculation with the same strain, but, if the blood had been sterilized by treatment, re-inoculation was followed by an acute attack. The drugs to be tested were passed into the stomach by a catheter. Six daily doses were given on consecutive days, the first 4 hours after the bird was inoculated with malaria. With quinine hydrochloride, the maximum tolerated dose was 10 mgm. and the minimum effective dose 2.5 mgm., so that the therapeutic index was 1.4. Two out of 10 birds were sterilized. With plasmoquine, the therapeutic index was 1.30. Sixteen out of 33 birds were sterilized, and in the other 17 the incubation period was greatly lengthened. To test the prophylactic action, 3 birds were given plasmoquine daily for 4 days and were then inoculated with malaria: the drug had no prophylactic action. Three more birds were inoculated and subsequently given plasmoquine for 4 days. Given in this way it acted prophylactically; infection was not prevented, but the incubation period was lengthened to 70 days.

Thirteen new quinoline compounds prepared by Professor ROBINSON and his colleagues were tested in the same way. Two of these compounds, R 25=8- γ -aminopropylamino-6-ethoxyquinoline and R 36, the similar methoxyquinoline, were found to resemble plasmoquine in their action, to be nearly equal to it in potency, and to have therapeutic indices of 1.16. The compound R 36 has been tested by JAMES, NICOL and SHUTE in malignant tertian malaria, but it proved inactive.

The action of plasmoquine, R 25 and R 36 upon normal blood was studied in vitro. Plasmoquine in a dilution of 1 in 50,000 produced methaemoglobin, R 25 and R 36 were even more active in this respect.

W F.

AMSTERDAM. BUREAU FOR INCREASING THE USE OF QUININE. Quinine Formula—47 pp. 1933

D'ARUSMONT (Phiquepal). Sur un cas de réveil tardif de paludisme constaté à Saint-Pierre et Miquelon—*Ann de Méd et de Pharm Colon* 1933 Oct—Nov—Dec Vol 31 No 4 pp 536-537

BEIJNEN (G. J. W. Koolemans). Malaria zonder koorts—*Nederl Tijdschr v Geneesk* 1934 Mar 3 Vol 78 No 9 pp 982-990

CECCARELLI (D). Considerazioni sopra un caso di nefrite acuta in infezione malarica—*Riv di Malarologia* 1934 Vol 13 No 1 pp 81-91 [35 refs] French summary (4 lines)

CHORINE (V.) & GILLIER (R). Le mécanisme de la réaction de Henry—*Ann Inst Pasteur* 1934, Feb Vol 52 No 2 pp 193-216 [35 refs] [See this *Bulletin*, Vol 31, p 180]

CORRADETTI (Augusto). Condizioni ematiche di una popolazione malarica di zona iperendemica in rapporto con l'immunità acquisita—*Riv di Malarologia* 1934 Vol 13 No 1 pp 1-61 With 13 graphs & 1 fig English summary

DEMURTAS (Marco Pazzi). Studio sulle variazioni dell' acido lattico sanguigno nei malarici cronici—*Riv di Malarologia*. 1934 Vol 13 No 1 pp 66-80 [22 refs] German summary.

DREYFUSS (André). Contribution à l'étude du paludisme dans la région des Hauts-Plateaux algériens. Le paludisme à Gélyville en 1930—*Arch Inst Pasteur d'Algérie*. 1931 June Vol 9. No 2 pp 352-373 With 9 figs. on 7 plates & 1 plan.

DUNCAN (D). Atebrin in the Treatment of Malaria in Malaya—*Jl Roy Nav Med Serv*. 1934 Jan. Vol 20 No 1 pp 34-50. [33 refs]

- GOSIO (Renato) Osservazioni sulle piastrine nella malaria (Observations on the Platelets in Malaria)—*Riv di Malarologia* 1933 Nov-Dec Vol 12 No 6 pp 1115-1139 With 8 figs on 2 plates [22 refs] English summary (7 lines) p 1217
- HENDERSON (L H) Atebrin in the Treatment of Malaria in the Sudan—*Trans Roy Soc Trop Med & Hyg* 1933 Nov 30 Vol 27 No 3 pp 285-288
- HENRY La lutte contre la paludisme à Tuyen-quang—*Bull Soc Méd-Chirurg Indochine* 1933 June Vol 11 No 4 pp 410-424 With 8 figs on 3 plates, 1 folding plate, 1 folding chart & 1 folding plan
- JERACE (Felice) Metodi per il conteggio dei parassiti malarici (Counting Methods of the Malarial Parasites)—*Riv di Malarologia* 1933 Nov-Dec Vol 12 No 6 pp 1193-1197 With 3 figs on 1 plate English summary (2 lines) p 1218
- KLIGLER (I J) Note on the Treatment of Malaria with Quinine and Plasmoquine—*Riv di Malarologia* 1933 Sept-Oct Vol 12 No 5 pp 841-847
- KRITSCHESKI (I L) & STERNBERG (E J) Die Synthese chemotherapeutischer Verbindungen II Die Chinolinderivate gegen Malaria—*Ztschr f Immun-tatsf u Experim Therap* 1933 Vol 80 No 5/6 pp 438-459 With 3 figs
- LA FACE (Lidia) Contributo allo studio della biologia delle diverse razze di *Anopheles maculipennis* (Contribution to the Biological Study of the Races of "*Anopheles maculipennis*")—*Riv di Malarologia* 1933 Nov-Dec Vol 12 No 6 pp 1069-1114 With 1 fig [21 refs] English summary pp 1216-1217
- LANDEIRO (Fausto) Un appareil à tamiser pour l'emploi du vert de Paris (A Sieve Apparatus for employing Paris Green)—*Riv di Malarologia* 1933 Nov-Dec Vol 12 No 6 pp 1165-1168 With 5 figs English summary (2 lines) p 1218
- LEGENDRE (F) Essais de traitements comparés du paludisme chez les indigènes des Hauts Plateaux de Madagascar par le "quiniostovarsol" et la "quinoplasmine"—*Bull Soc Path Exot* 1933 Dec 13 Vol 26 No 10 pp 1317-1322 With 4 figs
- LIÈVRE (H) A propos d'un cas de paludisme congénital à *Plasmodium praecox*—*Bull Soc Path Exot* 1934 Feb 14 Vol 27 No 2 pp 133-136 [27 refs]
- LOVAGLIO (R) Un caso di malaria acuta complicato da edemi Contributo clinico alla patogenesi degli edemi nella malaria acuta (A Case of Acute Malaria complicated with Oedema)—*Riv di Malarologia* 1933 Nov-Dec Vol 12 No 6 pp 1155-1164 [10 refs] English summary (5 lines) p 1217
- MONIER (H) Renseignements médicaux et entomologiques recueillis sur le paludisme dans la haute vallée du Mekong—*Bull Soc Path Exot* 1933 Nov 8 Vol 26 No 9 pp 1144-1147
- MONIER (H) Résultats des recherches d'index spléniques et hématologiques dans la haute vallée du Mékong—*Bull Soc Path Exot* 1933 Dec 13 Vol 26 No 10 pp 1252-1254
- MONIER (H) Le paludisme à Luang Prabang et à Paklay-Laos, en avril 1933—*Bull Soc Path Exot* 1934 Jan 10 Vol 27 No 1 pp 17-19
- NAVAS TORRES (A) La malaria y las intervenciones quirurgicas—*Bol. Asoc Med de Puerto Rico* 1933 Aug Vol 25 No 8 pp 500-508
- RUSSELL (Paul F) Terminology used for *Anopheles* of the *Funestus-Mimus* Subgroup in Recent Papers by Russell and Others—*Philippine J Sci* 1933 Aug. Vol 51 No 4. pp 553-554
- SERGENT (Edmond), SERGENT (Etienne) & CATANEI (A) Etude expérimentale de l'instinct du "retour à la pâture" chez les moustiques—*Arch Inst Pasteur d'Algérie* 1934 Mar Vol 12 No 1 pp 1-9 With 4 figs [Ante, p 418]

BUREAU OF HYGIENE AND TROPICAL DISEASES.

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PORADENOLYMPHITIS

INGUINAL PORADENITIS : LYMPHOGRANULOMATOSIS : CLIMATIC BUBO,
ETC

By Hugh S. STANNUS, M.D., Ph.D., F.R.C.P.

Sectional Editor, Tropical Diseases Bulletin

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In the corresponding number of this *Bulletin* for last year (Vol. 30, pp. 423-29) the present writer,¹ under the title "Recent views upon Climatic Bubo and some allied conditions," drew attention to the very interesting results which had attended the co-ordination of clinical and laboratory observations upon a series of conditions whose pathogeny up to that time had baffled the clinician. It had been demonstrated that Climatic Bubo and Lymphogranuloma Inguinale were one and the same disease and that together with the conditions known as Chronic Elephantiasis and Ulceration of the Vulva, Esthiomène, the Genito-anorectal Syndrome and Inflammatory Stricture of the Rectum, were due to an infection with a specific ultramicroscopic virus which could be transmitted to and passaged in laboratory animals. A method of diagnosis by means of an intradermal antigenic reaction had been introduced by FREI and proved of the greatest value

Shortly after that summary appeared, a monograph² was published giving a complete account of the history of the recognition of the several conditions, with a critical digest of all the published work on the subject, dealing with geographical distribution, aetiology, symptomatology, pathogenesis and pathology and a complete bibliography of over 900 references.

The present article therefore will be limited to a summary of such observations as have been published since the appearance of that monograph. General surveys of some part of the same ground have been published by several writers, among them RAVAUT & CACHERA,³ RAVAUT,⁴ HELLERSTRÖM.⁵

Nomenclature.

In the chapter² devoted to this question, attention was drawn to the multiplicity of terms which had been introduced and to the objections

which could be lodged against most of them. When the phrase "A Sixth Venereal Disease" was used it was specifically pointed out that it was employed with no suggestion that it should come into common usage. FAVRE,⁶ to whom we owe the term lymphogranuloma inguinale, has recently cast it aside in favour of that proposed by FEISSINGER, viz, Poradenitis. This name, while covering all the conditions in which an adenopathy plays the chief part in the morbid process, is still open to criticism in that it is inapplicable to those conditions in which the glands are not involved and to the disease as produced in animals by intracerebral inoculation, conditions in which lymphatic tissues and spaces are infected. The term poradenolymphitis was put forward as an alternative but in turn does not quite meet the case, though it would appear to overcome some of the difficulties. When the glands are involved, as of course they are in the majority of infections, the fully expanded form por-adenolymphitis or porolymphadenitis might be used, in cases in which the glands are not involved the contracted form porolymphitis might be adopted. We could speak, as I have previously pointed out, of a peri-rectal por-adenolymphitis, of a por-adenolymphitic perimetritis, of a porolymphitic infection of the skin, of a porolymphitic meningoencephalitis in the monkey: Climatic bubo might become porolymphadenitis inguinalis tropica, etc.

The objection that can be raised against the word lymphitis is that it suggests an inflammatory reaction in the lymph rather than in the walls of the lymph channel. Lymphatitis defined by Dorland as "inflammation of some part of the lymphatic system" might meet the difficulty in the form porolymphatitis. Lymphopathia venerea is another suggestion, but the term loses the specific prefix and is not so easily converted into derivative forms.

It would be a great advantage if this question of nomenclature could be settled by international agreement.

Geographical Distribution and Local Incidence

In the last summary mention was made of the first case of an indigenous infection in this country with experimental proof of the nature of the condition⁷ and of three cases subsequently recognized by ANWYL-DAVIES⁸ at the Whitechapel V.D. clinic, all cases of inguinal poradenitis. Since then no other cases have been recorded in Great Britain. The infection may be rare but the author believes that if sought for, they may be recognized. all such cases should be recorded. SCHULMANN⁹ thinks that the number of cases of I.P. (inguinal poradenitis) in Paris is on the increase: he had seen twenty-six cases in six months. LEVENSON¹⁰ alludes to ten cases of the genito-ano-rectal syndrome in Moscow; WEIN, KERZENBERG & SILBERG¹¹ to three cases of I.P. in the same city. KALZ & SAGHER^{12, 13} mention thirty patients suffering from I.P. treated in Prague. JONESCO-MIHAIESTI¹⁴ and his co-workers draw attention to the spread of the disease in Rumania; LONGHIN¹⁴ had seen ten cases in two years in the Bucharest Military Hospital. VERESS¹⁵ speaks of the increasing number of cases being recognized in Transylvania. PERKEL & SOURGIK¹⁶ state that the disease occurs over the whole Black Sea coastal area. From Italy there are numerous reports of cases of I.P. and of the genito-ano-rectal syndrome including those by CORACHAN¹⁷ and by VERCELLINO¹⁸ of Turin, DEL VIVO¹⁹ of Genoa, LEIDI²⁰ of Brescia, SANNICANDRO²¹ and JAJA²², both of Puglia, MAZZANTI²³ of Florence.

DEL VIVO has described four cases of the genito-ano-rectal syndrome in prostitutes with positive Frei reactions. Vercellino's patients were all suffering from I.P. BIZZOZERO had under his care in Turin in the twelve months 1932-33 fifteen males and eleven females suffering from the infection. He saw one conjugal case, two cases of ano-rectal disease and two of esthiomène, one of which gave a positive Frei reaction. CORACHAN writing upon inflammatory stricture of the rectum, upholds the virus of poradenitis as the causative agent. SANNICANDRO had met with twenty-three cases of poradenitic infection in Puglia; two had contracted their disease in Milan, the remainder at Bari. Cases of vulval ulceration and elephantiasis, ano-rectal disease and stricture are also cited by this author and by JAJA. DE GREGORIO & MURÚA²⁴ give some interesting figures for Zaragoza, where among others they had come across nineteen cases of rectal stricture: all yielded positive Frei reactions. BEJERANO & GALLEGÓ CALATAYUD²⁵ report having noted a great increase in the number of cases of I.P. in the summer of 1932 in Barcelona. A positive Frei reaction was found in 15 per cent. of forty-five prostitutes tested though none presented obvious manifestations of the disease. Later seventy-five prostitutes, stated to be without signs of infection, were submitted to intradermal antigenic inoculation: of these forty-nine returned and among these 11 per cent. showed positive results. They were all drawn from the lowest grades; others of higher station were all negative. This tallies with the findings of other observers, the disease is commoner among prostitutes of more degraded type. BARRIOLA & MAÑERU²⁶ refer to the same subject in San Sebastian.

In the United States the disease in all its forms has been discovered, chiefly in the coloured population, in such numbers that it can no longer be considered rare. This refers to indigenous infections and not to such cases as WILMOTH mentioned in 1928 when he stated that L.I. was met with relatively frequently in the coastal cities of the States, as nearly all these cases had contracted their disease elsewhere. A number of fresh cases have been published in the United States by DE WOLF²⁷ of Cleveland, Ohio, and others. WIEN & PERLSTEIN²⁸ met with twelve male and four female Frei positive cases in eighteen months in Chicago. MARTIN'S²⁹ figures in regard to stricture of the rectum in Philadelphia are interesting. A total of one hundred and sixty-seven cases had been seen; of these 81 per cent. were negroes, and all these were women, a fact which could not then be explained. More recently recourse was had to Frei's test, and twenty out of twenty-five gave positive results. It is interesting to compare these findings with those of WITHERSPOON³⁰ in New Orleans, to be mentioned later.

IVES & KATZ³¹ in describing a clinical case of L.I. in St. Louis refer to it as the first to be recognized west of the Mississippi. TOMLINSON & CAMERON³² in recording three cases of L.I. with positive skin tests, coming under their care in Omaha believe them to be the first cases to be diagnosed west of Cleveland, Ohio. The disease—L.I.—as met with in Chile, is the subject of papers by COURTTS³³ and by COURTTS & BIANCHI³⁴; their observations will be dealt with under aetiology.

There are but few new observations from Africa; they include those by MOUTOT³⁵ (Morocco), COHEN³⁶ (Algeria), ADVIER & RIOU³⁷ (Dakar) and GRAHAM³⁸ (Tanganyika).

GRAHAM has described three examples of genito-ano-rectal disease in women at Mwanza. In the first the distribution was ano-rectal, in the second the vulva was affected and there was a vaginal stricture, in the

third condyloma-like masses were present about the anus and vulva, associated with ulceration in the lower third of the vagina and a recto-vaginal fistula. All had enlarged inguinal glands; in one suppuration had occurred. All had had syphilis but antisiphilic remedies failed to improve their condition. These cases would seem almost certainly to be cases of porolymphitic virus infection. A history of syphilis is of course quite common because a large percentage of low-caste prostitutes have had that disease, but there is no evidence that it is a factor in the production of the condition. I would again like to draw the attention of all medical men practising among native races to the interest of this disease, and suggest the desirability of placing their observations on record, especially if supported by the results of skin tests. CLEMENT CHESTERMAN³⁹ since his return to the Belgian Congo, has kept a watch for cases, and in a private communication tells me that he has already seen quite a number of examples of inguinal poradenitis, including one partner-case and also cases of the genito-ano-rectal syndrome. What would appear to have been a typical case of I.P. has also been reported to me by P. L. C. GARNHAM⁴⁰ from Voi, Kenya—a male native with large masses of glands in each groin and numerous discharging fistulae. One of the excised glands examined in England (G. Marshall FINDLAY) shows the typical histological appearances of poradenitis.

ADVIER & RIOU³⁷ have noted a number of cases of L. I. infection at Dakar. Their figures are—7 Europeans, 48 natives : 39 male, 9 female. 47 cases inguinal poradenitis, including 1 partner-case and 1 case of abacterial urethritis : all Frei positive but mixed infections not uncommon. Positive skin tests were also observed in (a) a prostitute with syphilis, but no signs of disease; (b) five women with peri-proctitis and nodular perianal condylomata-like growths, of whom two also had rectal stricture and one vulval elephantiasis; (c) a syphilitic man with thickening of the wall of the rectum and rectal fistulae; (d) a European who had had an inguinal adenitis some years before.

In discussing the subject recently, Dr A. P. DAVIES⁴¹ informed me that these same conditions are to be seen among the native inhabitants of the northern half of the coastal zone of Western Australia. Dr. H. R. WORTH⁴² vouches for similar observations in regard to southern China. PENNANÉACH⁴³ mentions the disease in Hankow. NGUYEN VAN TUNG⁴⁴ has seen one hundred cases of L. I. in Saigon.

Inguinal poradenitis is common in the Dutch East Indies, BRANDON⁴⁵ came across one hundred and forty-five cases in 1931. This is confirmed by BONNE⁴⁶ and his colleagues.

Reference must also be made to the article by HELLERSTROM & WASSÉN⁴⁷ of Stockholm, who in 1932 issued a questionnaire to some 350 foreign dermato-venereological clinics and to medical men in Sweden concerning the incidence of L.I. infections. The analysis of the results of this investigation was presented in August 1933 and covers 1,636 cases of L.I. and 215 cases of esthiomène (genito-ano-rectal syndrome). It is not possible to summarise their findings here but it may be noted how not very uncommon the affection is in those cities in which investigations have been carried out.

The only other paper on "endemic climatic bubo" is by JANZ.⁴⁸

Aetiology: Diagnosis: Frei's Intra-dermo-reaction.

The virus aetiology of L.I. and C.B. (inguinal poradenitis) is now established upon an unassailable basis. The possibility of co-existing

infections must never be lost sight of, as the clinical picture may be thereby obscured. That infection is contracted venereally is the rule though as has been before pointed out exceptions may occur, a point worthy of remembrance in the case of children. LOCKWOOD and HEIDT⁴⁹ in the discussion upon BRANDON's paper on L.I. in the Dutch East Indies, did not think the venereal origin of the disease was proved, the latter because he had seen the affection in an old impotent Chinaman. Such an observation proves nothing except perhaps that the man was old and impotent. In BRANDON's one hundred and forty-five cases of I.P., the intra-cutaneous test was positive in all. Extragenital primary lesions will be dealt with in a later section.

The aetiological relationship of the virus to those other conditions which have been considered as manifestations of the sixth venereal disease has been more difficult to prove and has in fact not yet found acceptance in all quarters despite the ever increasing amount of evidence in its favour. The importance of Frei's skin reaction as a means of diagnosis is of the greatest importance and its more extended use and better understanding are imperative.

There is a useful paper by SCHUMACHER⁵⁰ on the subject. Some observers have questioned the specificity of the test in some one or other direction, both in regard to cases of I.P. and cases of the genito-ano-rectal syndrome. It has been held that because some cases of I.P. do not react, therefore the test loses part of its value. It is true failure to react may occur, the development of skin allergy may be delayed, obscured or may fail under certain conditions as in the allergic reactions of other affections. Some of these conditions are known and so soon as they are better understood so will the test have an even greater value than at the present time. That it must be carried out with care and with certain precautions has been maintained by FREI from the beginning. Some cases may react with one antigen and not with another, suggesting the possible existence of different strains of virus, but this has not been proved. A specific reaction may be obtained by intravenous injection of antigen, and this sometimes when the skin has failed to react, as pointed out by GAY PRIETO.⁵¹ Temporary desensitization of the skin may follow intra-dermal injections as shown by WIEN & PERLSTEIN.²⁸ Intra-dermal injections of antigen in 1/10 cc. doses at 3 to 5-day intervals using the skin of one forearm, results after eleven inoculations in loss of local reactivity, while the skin of some other part of the body, the back or the buttock, retains the power to react.

JERSILD⁵² has again reviewed his cases of the genito-ano-rectal syndrome. He classifies them as follows.—(a) 5 cases of "syphiloma" with rectal infiltration and stricture at 4 to 5 cm. above the anus, perianal infiltration and fistulae but no genital changes, (b) 6 cases exhibiting the complete syndrome, elephantiasis vulvae combined with ano-rectal lesions, (c) 1 case of elephantiasis vulvae, affecting the left labia and clitoris with retention of urine and a stricture of the vagina 6 cm. above the vulva. All had negative W.R., but 8 of the 12 cases were syphilitic—in 4 the syphilitic infection preceded the other condition, in 4 it followed some 3–10 years later. Four denied syphilis and clinical and serological evidence was negative. In 66 per cent. of cases therefore syphilis could be excluded. In three the gonococcal fixation test was done with two negatives and one doubtful result. In ten gonococci were sought with negative result. The Ito-Riensterna reaction for chancroid infection was performed in eleven

cases, eight were negative, one doubtful, two positive. In one of the positives there was a history of chancroid. Frei's test was positive in eleven out of the twelve cases, in the twelfth case the reaction was doubtful with one L.I. antigen and negative with a second antigen, but it is interesting to note that in this case there was a history of an inguinal bubo as long ago as 1908, and that pus obtained from a fistula leading to a perirectal abscess yielded an antigen which gave positive results when skin tested in a number of L.I. patients, and negative results with controls. Three husbands were tested, all had had inguinal buboes, all gave positive reactions; all were negative to tests with Dmelcos. JERSILD believes that though most cases of the G.A.R. syndrome are due to an L.I. virus infection, some proportion, however small, may not be so. He seems to think also that the elephantiasis is due to some secondary infection rather than due to the specific L.I. virus, and that the pathological changes are not specific. This is an attitude of extreme caution, and perhaps hardly warranted if all the accumulated evidence of others be considered.

An analysis of 48 unselected cases by BENS AUDE & LAMBLING⁵³ under whose care they came for ano-rectal disease is worthy of study. Of the 48, 27 with inflammatory stricture of the rectum were submitted to Frei's test—in 24 the reaction was positive; among these there had been a suppurative inguinal adenitis in 9, 3 exhibited the complete G.A.R. syndrome and 3 showed perianal growths. Further they found that among 10 cases suffering from an apparently simple rectitis or ano-rectitis, 4 yielded positive reactions and 3 partially positive reactions. In 11 patients there were abscesses, or fistulae resulting therefrom, at the anal margin. While these authors believe that the majority of cases of inflammatory stricture are due to the porolymphitic virus they are not prepared to say that there may not be a few cases of gonorrhoeal, syphilitic or tuberculous origin. They have argued that because in one of their most typical cases of rectal stricture, with ulceration, fistula-formation and inguinal bubo, the Frei reaction was negative, therefore the case was due to some other cause than the L.I. virus. This argument is, I think not sound. It should first be established that the virus is not the cause by using other available methods of investigation and be proved what other cause is effective.

Other co-existing venereal infections have by some been considered as factors in the production of G.A.R. disease; such a coincidence to my mind should only be looked upon as indicating the greater chance of venereal infection of all kinds. This is well shown by some figures given by BENS AUDE⁵⁴ and reproduced by LOUSTE & MÉZARD⁵⁵. Between 1910 and 1930 (before the introduction of Frei's test) 289 cases of rectal stricture were seen; of these, data are available in 226, among whom 186 were classed as inflammatory strictures. In only 12 of the 186 was there no history of venereal disease. 139 had had syphilis but there was no evidence that that disease was a causative factor. The following figures are given:—syphilis alone 84; syphilis and sodomy 50; syphilis and gonorrhoea 11; syphilis and chancroid 3; syphilis and tuberculosis 3; gonorrhoea alone 8; gonorrhoea and sodomy 4; sodomy alone; sodomy and chancroid 2.

BELGODÈRE⁵⁶ sees in an L.I. virus aetiology a complete explanation of all the facts concerning inflammatory stricture of the rectum and the so-called syphiloma ano-rectal of FOURNIER, but he in his turn has described at great length a case under his own observation since 1912 which he believes to be syphilitic in origin without apparently taking

the ordinary means by Frei's test of excluding a virus pathogeny. There is in fact nothing to support his thesis save his opinion.

SANTY⁵⁷ has similarly described a case in Lyon as one of syphilitic stricture of the rectum which clinically would appear to be one typical of virus infection, and he in the same way has adduced no evidence in proof one way or the other.

GOUGEROT & CARTEAUD⁵⁸ are among those who believe that cases of "recto-ano-genital elephantiasis may have a varied pathogeny and would include streptococcal infections, mycosis, tuberculosis, etc.," among the possible causes, basing their beliefs not so much on positive evidence in regard to these other supposed causes as on the negative Frei reactions in some proportion of cases, a position open to fallacy I think.

Reference has been made to the case of esthiomène associated with rectal stricture described by STEIN & HEIMANN of New York (1912) in which they postulated gonorrhoea as the cause and to STEIN's paper on syphiloma vulvae (1920), when he was inclined to believe that all these conditions were syphilitic in origin. In 1925 that author⁵⁹ published another case of syphiloma vulvae and again upheld the syphilitic origin of the condition. At that time, of course, porolymphitic infections as the possible cause were unknown and Frei's test had not been introduced. In 1933, however, in a paper on diseases of the vulva, STEIN⁶⁰ still apparently believes in a syphilitic pathogeny for cases which would appear to be perfect examples of the G.A.R. syndrome, but poradenitis is not even mentioned, no skin tests were done and no attempt made to isolate the virus. In the absence of such investigations the cases have no value.

Typical cases of the vulval affection with inguinal poradenitis and positive skin tests have been recorded by LÉPINAY & GRÉVIN⁶¹ at Casa Blanca. RICHTER⁶² has published a case of esthiomène with vaginal stricture and positive skin test in Berlin. OBRETEL⁶³ has also dwelt on the relationship between L.I. and chronic ulceration of the vulva. The Italian cases have been mentioned above. There is a note upon lymphogranulomatosis by LANGER.⁶⁴ COLE⁶⁵ of Cleveland, Ohio, has brought his figures up to date. He has observations upon 36 male and 1 female case of I.P.: 22 of these cases were negroes, 15 whites, in 21 the affection was unilateral, in 13 bilateral; 18 showed a primary lesion, 3 had a urethritis; in 3 conjunctivitis was noted, in 3 arthritis was present, in 2 erythema nodosum or multiforme. All yielded positive reactions to Frei's intradermal test. At the same time 1 white male, 1 coloured male, 2 white females and 11 coloured females came under observation with genito-ano-rectal disease. Six of these had positive W.R. but all fifteen gave positive Frei reactions. Among these cases were two of esthiomène type, of whom one had a rectal stricture as well, and one male with elephantiasis scroti and rectal stricture. All the others exhibited stricture of the rectum with indurated cauliflower-like perianal lesions. WITHERSPOON'S⁶⁰ twenty-six cases of vulval elephantiasis collected during the twenty years ending 1932 may also be mentioned. They were all coloured women under observation at the Charity Hospital, New Orleans. In 9 the W.R. was not done. Of 17, it was negative in 9 and positive in 8. These cases were all considered to be examples of syphilitic elephantiasis of the vulva, but it should be remarked that no mention is even made of poradenitic virus infections and no tests were carried out.

COUTTS & BIANCHI³⁴ of Santiago, writing on their observations upon inguinal adenitis in Chile, state. "the more extended use of the intracutaneous reaction of Frei has proved that this biologic test is not always specific" Before such a statement can be accepted, the grounds upon which it is based will need careful examination. These authors believe that errors occur "due to the fact that among the different symptoms ascribed to Nicolas and Favre's disease there exist two different diseases which give a positive reaction only when the proper antigen is used as a test" I think it will be apparent from what is stated by the authors that the errors are entirely of their own making and that Frei's test comes out triumphant.

They postulate virus A "which determines the following conditions preceded by the appearance of an ulceration on or around the genital organs or anus—inflammation of the inguinal lymph nodes (poradenitis of N et F.), esthiomène vulvae, elephantiasis penis et scroti (BARTHELIS & BIBERSTEIN) and chronic stricture of the rectum (JERSILD, FREI & KOPPEL)"; and virus B., which determines the appearance of systemic symptoms resembling those that precede the initiation of most infectious diseases; "after a few days the inguinal, deep iliac, mesenteric, lumbo-aortic and other lymph nodes appear inflamed", an exanthem and arthritis may occur; "no apparent site of inoculation can be found on or around the genital organs." "These different viruses are of buccal origin. . . cunnilinguism and other abnormal practices." Affections due to virus A. (36 cases) give positive skin reactions with an A antigen and are negative to B. antigen and conversely with those cases due to B. virus (18 cases). For the first group Coutts has used the term "sporadic disease of NICOLAS-FAVRE," to the second group he most unfortunately refers as "epidemic climatic bubo." The first group are obviously cases of poradenolymphitis. The second infection which occurs in epidemic form in the spring and counts among its other symptoms enlargement of the liver and spleen, and an eosinophilia, which it is stated may reach 20 per cent, is equally obviously nothing to do whatever with climatic bubo or poradenitis. The disease resembles more the epidemic adenitis described in Italy some years ago (SEMERO 1929, ISOTTI 1930, *et alia*) and is very suggestive of Tularaemia. These Chilean cases have been discussed at some length as the dicta expressed by COUTTS needed contradiction.

Positive skin reactions with poradenitic antigens have been found in persons who at the time have presented no obvious signs of infection. The observations of BÉJARANO and GALLEGO CALATAYUD²⁵ have already been referred to. Clément SIMON⁶⁶ similarly found that 10 per cent. of a series of prostitutes gave positive reactions. SÉZARY & LÉNÈGRE⁶⁷ and others have made similar observations, and the question of "carriers" has been raised. Carriers may or may not occur but it would be a wise man who could state with a certainty that in such cases no minimal lesions were present in the complicated system of the genito-urinary and lower intestinal tracts.

SCHULMANN⁹ obtained positive Frei reactions in the mistresses of two men suffering from L.I., who "only had a mild metritis." There was nothing to show, however, that the metritis was not of virus origin.

LÉPINAY & GRÉVIN⁶¹ performed cutaneous tests on 79 women at Casa Blanca using a monkey-brain antigen. In only 1 was a positive reaction obtained, a woman suffering from a chronic vulval ulceration, proved not to be due to syphilis, chancroid or tuberculosis. Another

woman, not in this series, who had typical vulval elephantiasis yielded a positive skin test ; both, it is interesting to note, had had a suppurative inguinal adenopathy. Eleven males and one female exhibiting typical I P. all gave positive Frei reactions.

LANZENBERG⁶⁸ has recorded a case "simulating" inguinal poradenitis with primary lesion in which W R, Dmelcos test and gland puncture were all negative, dark-ground examination negative, and Frei reaction negative. A smear from the urethra was positive for gonococci. No softening of the glands occurred and the condition cleared up. This case certainly suggests a "forme fruste" of I.P., associated with gonorrhoea in which the virus infection did not proceed far enough to excite skin allergy. It would have been interesting to have seen the result of intra-cerebral animal inoculation of gland pulp.

Symptomatology · Differential Diagnosis.

Much has already been said on this side of the subject but attention will here be drawn to some further points which have been brought forward in recent papers.

The primary lesion, as is well known, may be very small and evanescent ; on the other hand it may reach considerable size and form a nodule, in some cases it may present an appearance resembling a syphilitic chancre, as was originally noted by BORY and later by SÉZARY & PERRAULT.⁶⁹ SÉZARY & LÉNÈGRE⁷⁰ at the same time have drawn attention to chancre-like initial sores. Mixed infections must never be forgotten. LÖHE⁷¹ has described an excellent example of the primary lesion in the female, in his case situated at the orifice of Bartholin's duct. That the initial lesion may lie within the urethra is of course known. DE WOLF has published a good example—a coloured male with no visible penile lesion but a urethritis with bilateral inguinal bubo, Frei test positive, W R negative, gonococcus negative by urethral smear and gland puncture. He has recorded a similar case in a white man as have also LANZENBURG & ZORN.⁷² Similar pictures have been observed in tropical cases—climatic bubo. Probably every case of abacterial urethritis should be investigated as a possible case of virus infection. The possible relationship of such cases to those known as urethritis of Waelsch type and venereal urethritis of unknown nature, recorded by HISSARD & HUSSON, is of interest.

COHEN³⁶ of Oran has reported somewhat analogous cases in men and their wives, and BEZECNY⁷³ treats of the same subject.

Records of extra-genital infections apart from those in the ano-rectal region due to sodomy remain few in number, but CURTH⁷⁴ of New York has added one well authenticated case to the list. A negro ten days after practising cunnilingus developed on the tip of the tongue some non-painful blister-like lesions with considerable local swelling, followed by a glandular enlargement in the neck, forming a huge mass. Dark-ground examination of the exudate from the sores on the tongue was negative for spirochaetes. W.R. negative, no evidence of tuberculosis nor of a mycotic or Ducrey infection, Frei reaction positive ; an antigen prepared from the gland pus yielded positive reactions in L.I. patients and cases of ano-rectal disease and of rectal stricture. An almost exactly similar case has been recorded by BLOOM.⁷⁵

In 1932 LÉPINAY & GRÉVIN described a case of L.I. in which they suggested that infection had gained entry through a wound on the foot. In referring to this case at the time I considered that the evidence did

not warrant such a belief. This opinion has since been supported by GATÉ⁷⁶ so that once again it may be said that no such case of peripheral infection is known. FRANCHI⁷⁷ of Turin has shown that the skin involved in an inguinal poradenitis contains the virus in many cases by demonstrating that skin blister fluid gives a positive skin reaction in L.I. patients.

Reference has been made to meningeal symptoms in human poradenitic infections. This led MIDANA & VERCELLINO⁷⁸ of Turin to investigate the cerebrospinal fluid from eleven cases of typical I.P. with positive Frei reactions in which syphilis was excluded. In nine the C.S.F. was normal. In one the reactions of Pandy, Nonne, Weichbrodt and of Boltz were positive, in another these reactions were all positive with the exception of the Pandy reaction. The protein content was increased—30 cgm and the cell elements were above normal, in the first case reaching 46. The amylolytic activity was low in all eleven but absent in the two cases detailed above. The C.S.F. from these two cases gave positive skin reactions in L.I. patients, the others were negative. A case of some interest is reported by LAFARGUE and colleagues⁷⁹. All other treatments having failed in the hands of some other medical man, they cleared out the whole of Scarpa's triangle by curettage. Eight days later the patient developed general anasarca and polyuria with 9 gm of albumin per litre. There was an aseptic pyuria and no blood urea retention. After eight weeks improvement began and health was restored in seven months. The authors wonder whether this was a nephropathy due to the virus of L.I.

Elephantiasis following upon the surgical extirpation of poradenitic inguinal glands and subsequent "erysipelatous" attack is well exemplified by a case detailed by LOUSTE, CAILLIAU & SCHWARTZ⁸⁰.

Several authors have given descriptions of the evolution of the conditions included under the term genito-ano-rectal syndrome. It will be remembered that these conditions were generally considered to be due to a redux specific virus cellulitis along lymphatic channels running to affected glands. That this certainly is not always the case must not be lost sight of since it is known the skin and subcutaneous tissue alone may be affected. The following observations by GOUGEROT & CARTEAUD⁵⁸ are given at some length therefore as they possess a particular interest.

Early cases of the syndrome are seldom seen and it is only rarely that it is possible to follow its evolution. In the three cases now described the earliest lesion was a localized hypertrophy of a single fold of skin about the anus, or a limited sector of the vulva. In all three there was a history of syphilis. In the first it seems clear syphilis played no part, the Frei reaction was positive, and no other factor was involved. In the other two the Frei reaction was not carried out, they were old syphilitics and it is open to anyone to suggest that syphilis was a factor. The early lesion commences as a nodule, softening occurs and an abscess forms which opens on the surface by a fistula. This nodule is referred to as "La gomme du N-F." About these nodules the elephantiasic process begins, it is said, without any involvement of glands.

Case 1. A thickening of an anal fold occurred 2½ years before coming under observation; this had enlarged and on examination six small follicular lesions were found on the left labium and adjacent parts of the buttock, their orifices exuding a small amount of mucopus; some small

glands were present in the groin. In one of the lesions spirochaetes were discovered, a finding which, taken with the fact that the W.R. was negative and the Kahn feebly positive, the authors believed to indicate an early secondary infection of the follicular lesion with syphilis. Treatment for syphilis was instituted and cure established by July 1932. A year later the anal fold had undergone much greater enlargement into a cock's-comb like structure (so characteristic of the condition) with a prolongation into the anus. There was swelling of the labium with a resemblance to a localized elephantiasis. On the buttock were a number of nodules some of which had undergone softening, and opened on the surface by fistulae, others were found between the vulva and anus.

Frei's test was positive: Tuberculin test positive. Dmelcos test negative: streptococcal skin test negative. staphylococcal skin test mildly positive. gonococcal culture negative.

Case 2 was that of a woman with a history of anal chancre in 1922. The anal lesion under discussion began in 1925 while under treatment for syphilis, and remained unaffected by the treatment. It resembled that in Case 1, and there was besides, an abscess on the buttock. In 1928 marked infiltration and elephantiasis of the anal region and buttock was manifested with multiple fistulae in ano and a rectal stricture. The case then passed out of observation and no Frei test was done.

In the third case there was a history of anal chancre in 1916 and gonorrhoea followed by hemiplegia and icterus. In 1922 pulmonary tuberculosis supervened. (The husband had died of phthisis, the father was suffering from phthisis and syphilis) When seen in 1925 there was a condition about the anus as in the last case, a thickened right labium and a perineal nodule. Frei test not performed.

There is also an interesting Frei-positive case published by GATÉ, MICHEL & CHAPUIS⁸¹—W.R. negative, Ducrey negative, treponema negative. Oedema of the labia majora and preputium clitoridis associated with herpetiform lesions about the vulva and some small glands in the groins was followed by the development of a papillomatous condition of the ano-rectal region and stricture of the rectum.

A case by GOUGEROT, COHEN & PATTÉ⁸² also deserves notice. Following upon a small suppurative lesion at the anal margin four years before, there developed an elephantoid condition of the skin of the inner sides of the buttocks with some twenty fistulous openings, swelling of the left labium to twice the normal size, with polypoidal overgrowth and a bilateral non-suppurative adenopathy. W.R. reaction uncertain, Dmelcos test negative, tuberculin test strongly positive but guinea-pig inoculation negative. The Frei reaction in this case was negative but an L.I. pathogeny should not perhaps be ruled out without further investigations having been made.

Differential Diagnosis

PAUTRIER & LANZENBERG⁸³ have recorded an excellent example of the difficulties which may be encountered in the clinical diagnosis between poradenitis and an inguinal tuberculous adenitis.

FAVRE⁶ has described two groups of cases which may and indeed did cause some difficulty in clinical diagnosis. The first group he designates "Bubons cancéreux d'aspect inflammatoire," illustrated by (1) a case from which an inguinal gland was submitted for examination, removed from a 58-year-old male under treatment for nervous syphilis. (2) The case of a 32-year-old woman recorded by LOUSTE, THIBAUT & CHAVANY in the first place as "un cas de lymphogranulomatose subaigue évoluant chez une femme" (*Bull. Soc. franç. Dermat. et Syph.* 1923, p. 340) and later diagnosed as "epithélioma de la région inguinovulvaire considéré comme une lymphogranulomatose" (*Ibid.* 1933, p. 404). (3) and (4) Two cases coming under his own observation.

There are two papers by JONESCO-MIHAIESTI^{84, 95} and his colleagues following up previous work. Intra-peritoneal inoculation of monkeys with either pus or gland emulsions from 20 Frei-positive cases of L.I. demonstrated that there was some variability in virulence but in all a specific characteristic peritonitis was produced. The virus was present in the exudate and in the mesenteric glands and emulsions of these gave positive Frei reactions. Positive reactions were also obtained with antigens prepared from the brain and cord. The inoculation in the monkey may result in a septicaemia with haemorrhages in viscera and in the thyroid and adrenals associated with the acute peritonitis, or a subacute infection may occur which causes death in 30 to 40 days, with production of a subacute hyperplastic peritonitis and the formation of miliary granulomata, an adhesive pleuro-pericarditis and signs of paralysis in the hind limbs. In a third group of cases there is a progressive cachexia with anaemia, wasting and nervous symptoms, and at necropsy there is found marked thickening of the visceral peritoneum of the spleen and liver with adhesions, and hypertrophy of the abdominal lymphatic system. In yet another group after 10 to 15 days with signs of a mild peritonitis everything clears up. In another series of experiments these workers have confirmed the variability in susceptibility of monkeys. They have also found that in monkeys inoculated intraperitoneally there may develop an acute neuritis of the posterior nerve roots with demyelination of the nerve fibres and an ascending degeneration in the posterior columns of the cord as in tabes while the inflammatory reaction is similar in cell picture to that seen in the reaction to L.I. virus elsewhere, and goes on to the formation of micro-granulomata.

Histopathology.

There are references to the pathological changes in poradenitic infections by FROBOESE,⁹⁶ VERCELLINO,¹³ BONNE & his colleagues,⁴⁶ Franz KOCH,⁹⁷ but they do not call for special notice.

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MALARIA

MER (G.). Observations on the Development of *Plasmodium malariae* Lav. in *Anopheles elutus* Edw. Experimental Transmission of Quartan Malaria to Man from the Mosquito.—*Ann. Trop Med & Parasit.* 1933 Dec. 20. Vol 27 No 4 pp 483-488.

Three volunteers were infected by the bites of *A. elutus* which had been infected with *P. malariae* experimentally

These experiments were carried out in the Huleh area, Palestine, where quartan malaria predominates throughout the whole year. Mixed infections with *P. falciparum* are very common. The development of *P. malariae* in the mosquito is relatively slow. Ripe *P. malariae* oocysts, up to 80 μ in diameter, were not found until after 28 days. Ripe *P. vivax* cysts, 40 μ diameter, were found after 17 days or earlier; and *P. falciparum* cysts, 54 μ , after 18 days or earlier. The sporozoites of *P. malariae* were larger and more active than those of the other species. Three volunteers were infected with quartan malaria by the bites of *A. elutus* which had been experimentally infected by feeding on patients. Although large numbers of *A. elutus* were fed on patients whose blood contained gametocytes which exflagellated readily, it appears that few became infected

W Fletcher

GIOVANNOLA (Arnaldo). Caratteristiche alterazioni delle glandole salivari dell' *Anopheles maculipennis* infetto da parassiti malarigeni (Characteristic Changes in the Salivary Glands of "*Anopheles maculipennis*" infected by Malarial Parasites.)—*Riv. di Malarologia.* 1933 Nov-Dec. Vol 12. No. 6. pp. 1140-1146 With 12 figs. on 2 plates English summary p. 1217.

The author gives in tables the measurements of the salivary glands of ten normal and ten infected specimens of *A. maculipennis*, the anterior and posterior parts of both lateral and the median lobes. The averages of length do not reveal much difference, but the averages of the maximal widths of the posterior parts of the lateral lobes and of the median lobe are very different. The following is made up from the tables produced:—

		Average maximum width in microns		
		1st lateral lobe	2nd lateral lobe	Median
Normal glands ...	...	91	75	83
Infected „ ...	...	115	126	103

In colour the normal are pearly-grey and refractive to light, fairly firm and easily dissected; the infected glands are brown, not refractile but opaque and very fragile.

These changes are sufficiently obvious under a magnification as low as 10 diameters to enable a diagnosis of malaria infection to be made without proceeding to dissection.

H. H. S

HENRY (X.) Seroflokkulation bei Malaria Technik und Anwendung in der Praxis [**Technique and Practical Application of Seroflocculation in Malaria.**]*—Arch f. Schiffs- u Trop-Hyg* 1934 Mar. Vol. 38 No 3 pp 93-100

The discoverer of this method of serodiagnosis gives a detailed description of his technique and its practical applications in the diagnosis of malaria.

The author elaborated his method after having considered for a long time the Wassermann reaction in syphilis. A sentence in the Handbook on Tropical Diseases by KELSCH and KIENER interested him greatly. It ran as follows :—"All histopathological lesions in malaria are occasioned by the deposit in the organs of two pigments, the brown iron-containing pigment and the black pigment, the so-called melanin pigment, whose composition is not fully understood." The author considered that these pigments were not merely deposits but were active. They were malarial endogens and either produced anti-endogens or disturbed the colloidal state and produced certain flocculating peculiarities of the serum. The preparation of true malarial melanin presented great practical difficulties, so he investigated other substances with pigment like that of malaria ; the first was a substance containing iron, the second containing melanin.

He found the ferroflocculation reaction was not absolutely specific for malaria, but the melanoflocculation reaction was specific and also more sensitive. He then gives a very complete and detailed description of his method for carrying out the reaction, which should be read in original by all workers employing or proposing to employ his reaction.

As regards its particular applications, he considers it will be valuable in malignant tertian infections in which no parasites are to be found in the peripheral blood, either from their being lodged in the internal organs or having disappeared following administration of a specific drug. In the latter case the blood should not be taken, if possible, within 24 hours after administration of the drug. Also it will be useful for diagnosis in the intervals between attacks of fever, when the reaction is strongly positive ; it may be weak during the febrile paroxysm. In the slight and chronic cases of malaria also the reaction is strongly positive, in these cases the parasite is very rarely found.

Another interesting problem was dealt with, namely, that of persons who have contracted malaria in the tropics and returned to temperate climates. Professor RIEUX of Paris considers that for practical purposes malaria is cured after 2 years' residence in a temperate climate. CHAUFFARD disagrees with this view. ZIEMANN in Germany considers that malaria persists rather longer than 2 years. Numerous serological examinations of persons who had contracted malaria during the war and in the colonies showed that only 1 to 1.5 per cent. gave positive reactions. So a chronic malarial state in these persons is the exception ; the exceptional cases can be investigated by the melanoflocculation test.

The author directs attention to a matter which he has dealt with before, viz, that the treatment of chronic malaria is greatly helped by administration of extracts of liver and spleen since they appear to activate the specific drugs, and thus a better result is obtained than when the latter are given alone. The flocculation test becomes

negative under this treatment. He hopes that his method will prove of value in the future in connexion with the diagnosis and treatment of malaria.

E D W Greig

VOIGTLÄNDER (W). Untersuchungen ueber die Serumflockungsreaktion bei Malaria von Henry [**Henry's Serum Flocculation Reaction in Malaria.**]—*Ztschr f Immunitätsf. u. Experim Therap.* 1934 Feb 15 Vol 81 No. 5.6 pp 377-400. [18 refs.]

Observations carried out on Henry's flocculation reaction in cases of malarial infection of man and animals.

As antigen the author employed melanin derived from the choroid of the eye of the ox, he considers this more sensitive than iron. In his technique he employs a formalin control which excludes cases of kala azar by giving a positive formol-gel reaction in that disease. He employs only half the amount of serum, 0.1 cc, and reagents recommended by HENRY. The test is carried out in 5 tubes. The tubes are placed in a water bath at 37°C for 2½ hours and then they stand at room temperature for half an hour. At the end of 3 hours the results are read. He divides his work into two parts. In the first he deals with the reaction in cases of inoculation malaria, normal human sera and in sera of patients without malaria. In the second part he records the results of his investigations on the reaction in different experimental animals, chronic piroplasmosis of dogs, bird malaria, and birds infected with halteridia. In all about 224 sera were investigated.

From his research he concludes—In acute human malaria the reaction is positive. Patients who have suffered from other diseases but not malaria give a negative reaction. He has had only once a definitely positive reaction in another disease, namely, secondary syphilis. In acute, latent and chronic malarial infection of birds the reaction is positive also. In piroplasmosis of dogs and other animal infections (halteridia) related to malaria the reaction is negative. In inoculation malaria in general paralysis in men the reaction gives a fairly accurate picture of the development of the malaria and indicates the disappearance of the infection after treatment. He considers that Henry's melanoflocculation test is of considerable value in the diagnosis of malaria, and fills a lacuna, which had hitherto existed in the recognition of malarial infection.

E. D. W. Greig.

CHORINE (V.) & RODIEUX (M). La réaction de Henry et le diagnostic du paludisme [**Henry's Reaction in Malaria.**]—*Bull Soc. Path. Exot.* 1933. Dec 13. Vol. 26. No. 10 pp 1249-1252.

The authors subscribe to the usefulness of Henry's reaction in the diagnosis of malaria.

Between November 1932 and November 1933, the authors employed Henry's reaction in 171 cases. The first group consisted of 87 men who had suffered from malaria in the great war, or who had lived in France for more than two years after residence in the colonies. Of these, 94 per cent. were negative, 2 per cent. were doubtful, 4 per cent. were positive. The second group consisted of 74 men without parasites in their blood who had returned from the colonies during the last two years. Of these, 72 per cent. were negative, 11 per cent. were doubtful, and 17 per cent. were positive. The third group consisted of men who had returned from the colonies within two years and who had parasites

in their blood Seventeen of them were positive and 4 negative. Two of the negative cases were in the middle of an attack when the blood was taken. Positive reactions diminished with treatment, and disappeared in 30 to 60 days W F

GERBINIS (P). La réaction de Weil-Félix est négative dans le paludisme [(Henry's Reaction in Typhus and) the Weil-Felix Reaction in Malaria.]-*Bull. Soc. Path. Exot.* 1934 Jan 10 Vol 27. No. 1. pp. 19-20

Henry's reaction is positive in typhus, and follows the curve of the Weil-Felix reaction, but the Weil-Felix reaction is not positive in malaria [see this *Bulletin*, Vol. 30, p. 892] W F

TAREJEW (E. M.) & POUTCHKOVA (A. I.). Sur l'exploration fonctionnelle du système réticulo-endothélial dans le paludisme. (Investigation on the Function of the Reticulo-Endothelial System in Malaria.)-*Riv. di Malariologia* 1933 Sept-Oct. Vol. 12 No. 5 pp. 859-872. [17 refs.] English summary (9 lines) p. 1063.

The Congo-red test did not demonstrate clearly a blocking of the R. E. system in malaria

The importance of the reticulo-endothelial system in immunity is well established. Natural immunity is lowered by its blockage, for example, KRITCHEVSKY inoculated mice with a strain of Dutton's spirochaete which was non-pathogenic, but when the R. E. system was blocked with saccharated iron the infection killed 46 per cent., or, if the spleen was removed at the same time, 90 per cent. Similar results have been obtained with monkeys infected with non-pathogenic malaria parasites (see KRISHNAN, SMITH & LAL, *ante*, p. 179). In human malaria there is a blockage of the R. E. system by melanin, and RUGE attributes the lack of complete immunity to this cause. In order to test the capacity of the R. E. system ADLER has employed intravenous injections of Congo-red, a nondiffusible substance which is removed from the blood by this system. The co-efficient of Congo-red is the percentage which remains in the blood, one hour after the inoculation of 10 cc. of a 1 per cent. solution. The authors found this to be between 65 and 66 in non-malarious subjects. They expected to find a high index in malaria owing to failure of the blocked R. E. system to take up the Congo-red; but they were disappointed for in acute and severe cases the index was approximately normal. In non-complicated malaria there was a tendency for the index to decline and for the monocytes to increase as the health of the patient improved, and it is suggested that this may be a manifestation of immunity. W. F.

LANDEIRO (Fausto). Die Blutsenkungsreaktion bei Malaria [Sedimentation Index in Malaria.]-*Arch. f. Schiff- u. Trop.-Hyg.* 1934. Jan. Vol. 38. No. 1. pp. 38-41. With 2 figs.

A series of observations carried out in cases of malaria on the sedimentation of red cells of the blood.

144 patients were investigated of which 71 were men and 73 women. 55 were infected with *P. vivax*, 2 with *P. malariae*, 21 with *P. falciparum*, 3 with *P. vivax* and *falciparum*, 27 were doubtful, and 34 negative. As the result of his investigations the author reaches the

following conclusions :—The sedimentation index is increased in cases of malaria. The increase is more marked in females than in males. Age has a very slight influence on the increase. There is no direct connexion between it and the species of parasite and intensity of infestation. There is a certain correlation with splenomegaly. Treatment in many cases reduces the index to normal, and it can act to a certain extent as an indicator of the favourable effect of treatment, but it cannot guarantee absolutely a parasitological cure.

E. D. W. Greig

MORIN (H.), BADER (H.), MONNIER (E.) & MOREAU (P.). Sur l'hyperchlorémie globulaire des paludéens au Tonkin. [**Corpuscular Hyperchloraemia in Malaria.**]—*Bull. Soc. Path. Exot.* 1934 Feb. 14 Vol 27 No 2. pp. 136-140.

The chlorine content of the blood corpuscles rises during an attack of malaria.

In 9 Annamites free from malaria the chlorine in the plasma averaged 3.65 grams per litre, and in the whole blood 2.78 grams. In 9 healthy Europeans, the figures were respectively 3.56 and 2.72. The same tests were carried out on 34 Annamites and 10 Europeans during attacks of malaria, with the result that while the amount of the chlorine in the plasma was found to be unaltered, the total chlorine had increased from 2.78 to 2.98 in the Annamites, and from 2.72 to 2.98 in the Europeans. The hyperchloraemia of malaria is due therefore to an increase of chlorine in the corpuscular elements.

W. F

ACKERMAN (V.) & FILATOV (A). On the Possibility of preventing Transmission of Malaria by Blood-Transfusion. (An Experimental Study of the Bacterioidity of Conserved Blood with Respect to the *Plasmodium malariae*.)—*Jl Trop. Med. & Hyg.* 1934. Feb. 15. Vol. 37. No. 4. pp. 49-57. [25 refs.]

If citrated blood is kept for 5 days at 4°-6°C. any benign tertian parasites it may contain will perish.

The authors review the published accounts of numerous accidental transmissions of disease which have occurred during blood transfusion. Malaria appears to be the most common of the diseases transmitted in this way. The authors kept citrated blood infected with *P. vivax* on ice, at a temperature of 4° to 6°C. During the first four days stained films still showed some healthy parasites, though many had become shrivelled up and extracorpuseular by the end of this period. Blood inoculated during these four days usually produced malaria. After the fourth day no parasites could be found in films, nor did the blood produce malaria when it was inoculated. At a higher temperature the parasites disappeared more quickly. The addition of minute quantities of quinine to the citrated blood did not accelerate their destruction until a concentration of 1 : 1,000 was reached. Quinine in this concentration did not hasten the occurrence of haemolysis; this did not begin until the 12th day in the citrated blood, either with or without quinine; In higher concentration quinine produced lysis and clotting. The therapeutic effect of transfusing blood which had been kept for ten

days was equal to that of fresh blood *P. falciparum* did not disappear until after 5 days' storage [*P. malariae*, in the title, apparently means malaria parasite irrespective of species] W F

GIBBINS (E. G.) **Morphological Study of Malaria Pigment in Oocysts of Naturally Infected Anopheles.**—*Parasitology*. 1933 Dec Vol. 25 No 4 pp. 428-435 With 4 figs

During his examination of anopheles in Uganda for evidence of malarial infections the author made drawings of 204 oocysts found in *Anopheles costalis*, *A. funestus* and *A. theileri* var *hancocki*. In this paper he describes the characters of the pigment in the oocysts which appear to indicate the species of parasite involved.

Plasmodium vivax—yellowish or light brown and consisting of delicate rods or grains arranged as a clump, a single curved line, or several fine lines crossing one another. *Plasmodium malariae*—dark brown or black, coarse and clearly visible irregular masses and rods, usually 6 to 8 in number (occasionally up to 12) arranged in curved or straight line, a clump or rarely scattered about cyst. Under high magnification the large masses were often seen to be composed of aggregates of individual rods or granules. *P. falciparum*—black grains sometimes arranged as a curved line but more frequently as a clump. The number of grains of pigment varied, being few or absent from some cysts in heavy infections. *P. ovale*—dark brown grains 15 to 30 in number and shaped like a cocco-bacillus and arranged in two or more curved intersecting lines at centre of cyst.

A series of outline drawings depict very clearly the various characters described. C. M. Wenyon

CRAIG (Charles F.). **The Nomenclature of *Plasmodium ovale* Stephens 1922.**—*Amer. Jl. Trop. Med.* 1933. Sept Vol. 13. No 5 pp. 539-542

The author in 1900 described a peculiar form of malarial parasite which in 1926 he concluded was identical with *Plasmodium vivax* var. *minuta* Emin, 1914. Whatever EMIN's parasite may be, and there is reason to suspect that it was at least in part *P. falciparum*, it seems clear that it was not *P. ovale* Stephens, 1922, with which the author now identifies the parasite noted by him in 1900. C. M. W

GUARDABASSI (M.). Sur la filtrabilité du parasite du paludisme [The Filterability of the Malaria Parasite].—*Boll. Sezione Ital., Soc. Internaz. di Microbiologia*. Milan. 1933. Dec Vol 5. No. 12. pp. 337-338.

The results were negative.

The author has made repeated experiments with citrated, laked and defibrinated blood in tertian and subtertian malaria, but the parasites were always held back by the filter. He has inoculated refractory animals, such as rabbits, with malarious blood and, an hour later, he has filtered the animal's blood, but the parasites did not pass the filter. He also altered the pH of the infected blood before filtration, but the result was the same [this *Bulletin*, Vol. 30, pp. 487 and 857].

W. F.

SINTON (J. A.) & MULLIGAN (H. W.) A Critical Review of the Literature relating to the Identification of the Malarial Parasites recorded from Monkeys of the Families *Cercopithecidae* and *Colobidae*—*Records of the Malaria Survey of India*. 1932 Dec. Vol 3 No 2. pp. 357-380 and 1933 June No. 3. pp 381-444 With 35 figs on 1 plate [3 pages of refs]

By collecting and examining critically the literature dealing with the malarial parasites of monkeys in the Old World the authors have rendered a signal service to those who are interested in these parasites. They say that it is difficult or impossible to reconcile the considerable morphological differences between various parasites which have been grouped in a single species. They have found it necessary to create several new varieties of existing species because it seemed that this was an essential preliminary step towards the clearing up of the confusion which exists. It is recognized that the differences may be dependent on inadequacy or inaccuracies in the original descriptions or to the fact that unrecognized mixed infections were being dealt with. The species which the authors recognize are as follows:—

1. *Plasmodium kochi* (Lav.), 1899, sens. restr. and three varieties, viz., *boulhezi* Leger, 1922, *joyeuxi* Leger, 1928 and *macfiei* var. n. Sinton and Mulligan, 1932.
2. *Plasmodium inui* Halberstadter and Prowazek, 1907 (sens. restr.) and two varieties, viz., *cynomolgi* Mayer, 1907 and *gonderi* var. n. Sinton and Mulligan, 1932.
3. *Plasmodium knowlesi* sp. n. Sinton and Mulligan, 1932.
4. *Plasmodium semnopitheci* Knowles, 1919.

This, it is admitted, is merely a tentative classification based on the descriptions which have been given and serving a useful purpose till more accurate studies can be carried out.

Attention is drawn in an appendix to the possibility of mixed infections and the suggestion is made that the morphological variations in a single species resulting from a difference in host described by KNOWLES and Das GUPTA (this *Bulletin*, Vol 29, p 701) were due to the fact that two distinct parasites (*P. knowlesi* and *P. inui* var. *cynomolgi*) were involved. Experimental evidence in support of this suggestion is given. The characters of *P. knowlesi* as seen in pure infections are illustrated in a plate. It is pointed out that the monkey in which KNOWLES and Das GUPTA first saw the malarial parasites studied by them was identified as *Cercopithecus pygerythrus*. This appears to have been an error, the monkey actually being *Silenus irus* (*Macacus cynomolgus*). The natural host, therefore, of *P. knowlesi* is this monkey and not the African one. It is stated in a footnote that the sporogony cycle of *Plasmodium inui* var. *cynomolgi* has been obtained in a number of anopheles, sporozoites having been found in the salivary glands of *A. annularis* (*A. fuliginosus*), *A. splendidus* (*A. maculipalpis*), *A. maculatus* and *A. culicifacies*. The infection was actually transmitted to a *S. rhesus* by the bite of *A. annularis*. This anopheles has also been infected with *P. knowlesi*.

C. M. Wenyon.

SCHWETZ (J.). Sur une infection malarienne triple d'un chimpanzé [A Triple Malarial Infection in a Chimpanzee.]—*Zent. f. Bakt.* I Abt. Orig. 1933. Nov. 1. Vol. 130. No. 1/2. pp. 105-110 With 1 coloured plate.

In the blood of a chimpanzee about a year old which had been captured in the forests a hundred miles from Stanleyville and sent to

the laboratory at this place, malarial parasites were discovered. The animal was kept under observation for three months during which not only did the intensity of the malarial infection vary, but also the character of the parasites. It appeared that there was a triple infection of *Plasmodium falciparum*, *P. vivax* and *P. malariae*, the proportion of each varying from time to time. On one occasion a trypanosome was seen in the blood and on several occasions microfilariae. The chimpanzee did not appear to be in ill health as a result of the various infections. A beautiful coloured plate of 34 infected red cells shows the types of malarial parasite encountered. C. M. W.

SCHWETZ (J.). Contribution à l'étude des parasites malarieux (*Plasmodium*) des singes inférieurs africains [**Malaria Parasites of African Monkeys.**].—*Zent. f. Bakt. I. Abt. Orig.* 1933. Nov. 1 Vol. 130. No. 1/2. pp 111-120. With 3 figs. & 2 coloured plates.

The author has found that monkeys in the Belgian Congo belonging to various genera (*Cercopithecus*, *Cercocebus*, *Colobus*, *Cynocephalus*) are commonly infected with a malarial parasite of uniform morphology.

The young rings resemble those of *Plasmodium falciparum*, but as growth occurs they take on the character of *P. vivax*, though the red cells are only rarely enlarged and that slightly, while Schüffner's dots do not occur. No pigment could be found in any of the asexual forms though the male and female gametocytes contained large quantities of yellow brown pigment. The asexual forms showed no sign of preparation for division in nuclear multiplication and no mature schizonts were seen, but in the bone marrow smear of one heavily infected monkey forms like the schizonts of a species of *Theileria* were found. Whether these are related to the malarial parasite was not determined. The parasite, illustrated in a coloured plate in its various forms, differs from the descriptions which have been given for *P. kochi* and *P. inui*. In view of its peculiar characters the author wonders if the parasite actually belongs to the genus *Plasmodium* C. M. W.

MULLIGAN (H. W.) & SINTON (J. A.). **Studies in Immunity in Malaria. Part III. Multiple Superinfections with Various Strains of *Plasmodium knowlesi*.**—*Records of the Malaria Survey of India.* 1933. Dec. Vol. 3. No. 4. pp. 809-839. [10 refs.]

Infection and re-infection of *S. irus* with several different strains of *P. knowlesi* may render it immune to some other strains, but will not render it immune to all [see this *Bulletin*, Vol. 30, p. 831].

The authors here describe further experiments in immunity as studied with strains of *P. knowlesi* isolated from seven different specimens of *Silenus irus* (*Macacus cynomolgus*, *Macacus fascicularis*, the crab-eating macaque of Burma, Siam, and the Malay Peninsula). The object of these experiments was to determine if superinfection with a number of strains would render monkeys immune to all strains. If this should prove not to be the case, doubt would be thrown on the value of "salted" labour when employed in places far removed from the districts in which it was recruited. The monkeys used in the experiments were *S. rhesus*, and infection was conveyed by blood inoculation. A chronic or latent infection with one strain of *P. knowlesi* protected the monkey against further inoculations of the same strain; these were sometimes followed by an increase in parasites, but never by clinical

symptoms. Inoculation with one strain did not protect against another, unless it happened that they shared some antigenic component. Repeated inoculation with several different strains did not insure immunity to all. For example, a rhesus monkey was inoculated with a strain C, and had a very severe attack followed by a chronic infection with occasional parasites which were found up to the 310th day. It was superinfected on the 343rd day with strain K1 and suffered a moderately acute attack. It was inoculated with other heterologous strains, K2, K3, and K4, on the 379th, 427th and 484th days respectively. The results of these last three inoculations were much less severe, possibly these strains contained some antigenic components present in the strains previously injected, but universal immunity to all strains of *P. knowlesi* had not been attained in spite of the long period of infection and the multiplicity of the infecting strains, for inoculation of another strain, K6, on the 523rd day, produced a very severe infection from which the animal died on the 529th day. W. F.

KRISHNAN (K. V.), SMITH (R. O. A.) & LAL (Chiranj). **Contributions to Protozoal Immunity. Part II. Immunity to Malaria in Monkeys and the Effect of Splenectomy on it.**—*Indian Jl. Med. Res.* 1934. Jan. Vol. 21. No. 3. pp. 639-647 [15 refs.]

Acquired immunity to malaria in monkeys is generally, but not always, due to latent infection.

The ordinary course of the disease in *Macacus* (S.) *rhesus* inoculated with *Plasmodium knowlesi* was as follows:—A primary acute attack, treated with quinine, lasted from 4 to 10 days. A second short period of about the same length followed, with no parasites and no treatment. Next came a third period of 4 to 8 weeks duration characterized by relapses which were treated with quinine whenever the parasites numbered more than five per microscopic field. This was followed by a fourth period lasting for months, during which the animal appeared to be in good health and no parasites were found in the peripheral blood. The monkey now possessed a high degree of acquired immunity to re-inoculation of infective material [? the same strain of parasite]; but, if the spleen were removed, an intense infection resulted which showed that the immunity was associated with a latent infection. The above procedure is recommended as an economical method of maintaining a strain of monkey plasmodium in the laboratory. The presence of dividing monocytes [? in films made from spleen-puncture] appears to indicate latent infection and immunity. Although acquired immunity is usually due to latent infection, there is some indication that in a small percentage of monkeys it may be present in the absence of any such infection, this applies particularly to *irus* and *radiahus* monkeys. W. F.

WATS (R. C.) & GUPTA (B. M. Das). **Comparative Biochemical Findings in Blood of Normal and Malaria-Infected Monkeys.**—*Indian Jl. Med. Res.* 1934. Jan. Vol. 21. No. 3. pp. 475-481. [13 refs.]

The authors found no noteworthy changes in the blood-sugar, non-protein nitrogen, or calcium in monkey malaria. No marked increase of inorganic phosphates occurred in untreated cases, but there was a rise in animals treated with quinine or atebirin. The cholesterol of the plasma was lowered. W. F.

HUFF (Clay G.). **Comparative Studies on Susceptible and Insusceptible *Culex pipiens* in Relation to Infections with *Plasmodium cathemerium* and *P. relictum*.**—*Amer. J. Hyg.* 1934 Jan. Vol. 19 No. 1 pp. 123-147 With 2 text figs and 20 figs on 2 plates [16 refs.]

A study of the development of *Plasmodium cathemerium* and *P. relictum* in *Culex pipiens* with a view to determining if there was any difference in the stomach of susceptible and insusceptible mosquitoes.

The mosquitoes were fed twice at an interval of 5 days on birds infected to such a degree that each ingested from 53,000 to 26,000 gametocytes. Of 80 fed upon birds with *P. cathemerium* infection 43 showed normal parasites from both feeds while 30 had no parasites. Similarly, of 57 ingesting *P. relictum* 23 were infected from both feeds while 32 failed to become infected. The 9 remaining failed to show parasites from one feed but it is thought that those from the other feed may have been overlooked. The stomachs were examined by serial section. As regards the histology of the blood meal and the surface epithelium there was no difference between the susceptible and the insusceptible mosquitoes. Normal and degenerating zygotes were found in both for about 30 hours, the number of normal zygotes decreasing in general with the passage of time. After about 18 hours oocysts began to appear on the outer surface of the stomach in susceptible mosquitoes. In the stomach degenerating zygotes were regularly present from 12 to 30 hours and irregularly up to 68 hours. No evidence of a cellular response to invasion by the parasite could be detected. Penetration of the epithelial lining of the stomach was by a gradual sinking of the parasite between two cells. In no case was there any evidence of an active boring into a cell or between the cells. In the process the long axis of the parasite was parallel to the surface of the stomach.

The conclusion is that as no visible difference between the susceptible and insusceptible mosquitoes could be detected it would seem that the difference must be a biochemical one involving possibly enzymes or humoral parasitocidal substances. Incidentally a study of black spores within oocysts of all ages was carried out. All stages in the altering of sporozoites were followed, from an initial yellowing and thickening till they were no longer recognizable as such but appeared as large dark brown bent or twisted structures. The author's view is that the change is due to chitinization, possibly as a result of invasion of the oocysts by very fine tracheoles.

C. M. Wenyon.

HECHT (Otto). **Experimentelle Beiträge zur Biologie der Stechmücken V. Ueber den Wärmesinn der *Anopheles maculipennis*-Rassen bei der Eiablage. [Heat-Sense of *A. maculipennis* Races in Deposit of their Eggs.]**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934. Mar. Vol. 38. No. 3. pp. 124-131. With 1 fig.

Different races of *Anopheles maculipennis* are found in different parts of Europe, and one of them is said to favour cold water. Is it possible to find a physiological explanation of the differences in geographical distribution?

The author has taken females of different races, laying eggs distinguishable by colour and pattern, and given them opportunities of laying eggs in vessels kept at different temperatures. He has repeated his experiments again and again at different seasons, using many

mosquitoes, and recording the laying of tens of thousands of eggs. His results show conclusively that females which lay "dark" and "banded" eggs exercise no choice at high temperatures, for instance between water at 34°C. and at 28°C. But if the choice is between cooler waters (29° and 19°C.) the "dark" eggs are placed indiscriminately, but the "banded" eggs are nearly all in the warmer vessel. At a lower pair of temperatures (25° and 18°C.) this limitation of the banded eggs becomes clearer still.

Once again the physiologist has systematized a number of field observations, of which he has provided a clear and single explanation.

P. A. Buxton.

WEYER (Fritz) Beobachtungen an Hausanophelen im Zusammenhang mit der Rassenfrage bei *Anopheles maculipennis*. [Observations on House Anopheles in connexion with the Racial Question in *A. maculipennis*].—*Ztschr. f. Parasitenk.* 1933. Dec. 18. Vol. 6. No 3 pp. 288-307. [24 refs.]

ROUBAUD'S theory of zoophily and androphily, as respectively characteristic of the two races of *A. maculipennis*, received no support from the author's investigations, conducted in a large *atroparvus*-area in E. Friesland, the only part of Germany where malaria is endemic.

Not only the race or variety mentioned, but also var. *messeae* was found to suck both human and animal blood, and it has been shown experimentally that both races are equally susceptible to malarial infection. It would seem, then, that the true explanation of the diminution and present day distribution of malaria in Europe, or in other words of "anophelism without malaria," has yet to be found. In the area investigated *Anopheles* in houses were very few in number in comparison with those captured in occupied cowsheds, pigsties and stables, where both races occur more abundantly, although they also enter houses. Possibly the presence of the non-malaria-carrying var. *messeae* in bedrooms is explicable on MARTINI'S hypothesis that, after feeding, the insects seek out places where the temperature is below 16°C., so that the development of plasmodia becomes impossible.

E. E. Austen.

SAUTET (Jacques). Contribution à l'étude de l'*Anopheles maculipennis* en Corse. Gîtes d'été et gîtes d'hiver, dans leurs rapports avec le paludisme. [*A. maculipennis* in Corsica: Summer and Winter Haunts in Relation to Malaria.].—*Ann. Parasit. Humaine et Comparée.* 1934. Jan. 1. Vol. 12. No. 1. pp. 8-14. With 1 fig.

In the warm eastern plain of Corsica, the summer and winter haunts of *A. maculipennis* are often very different. The former are divisible into feeding places and such as are associated with the hatching-out of adults and oviposition, and in both the proportions of the sexes show marked disparity. The winter haunts, on the other hand, while sometimes the same as those of summer, frequently consist for the most part of unoccupied premises or cavities. Here, however, the mosquito bites readily, if disturbed by man, and so may occasionally transmit malaria at this season. There is thus in Corsica a homodynamous race, with all the characteristics to which ROUBAUD and the Dutch authors

have drawn attention, though here a mosquito, which is chiefly domestic in summer, frequently tends to behave like a "wild" species in winter, and very differently from the way in which it comports itself in Holland, where, as shown by SWELLENGREBEL, human dwellings form its places of winter concentration. Thus the biology of the same species of *Anopheles*, or even of the same race, may differ very greatly in different countries, and this very often explains the apparent contradictions in the regional epidemiology of malaria. E E A

- i. TOUMANOFF (C.). Recherches sur la fréquence saisonnière de diverses espèces anophéliennes au Tonkin (Bassin du Fleuve-Rouge). 3e Note: *A. (Neocellia) maculatus* (Théo) [**Seasonal Frequency of Various Species of Anophelines in Tonking (Red River Basin).**]*—Bull. Soc. Path. Exot.* 1933. Oct. 11. Vol. 26 No. 8. pp. 1020-1022 With 1 fig
- ii. —. Quatrième note: *A. (Neocellia) fuliginosus* Giles, *A. (Neocellia) maculipalpis* var. *indrensis* James et Liston, *A. (Neocellia) philippinensis* Lüdl.—*Ibid.* Nov 8 No 9 pp. 1167-1171.

1 In Tonking, the seasonal frequency of *Anopheles maculatus* coincides with that of *A. minimus* (*ante*, p. 55), whose breeding places it frequently shares. The abundance of both species during the winter monsoon is of special significance in connexion with the severity of the incidence of malaria in the middle and upper regions of the Red River basin.

ii While two years' investigation of the species of the *Neocellia* group in Tonking proved not altogether conclusive, it appears that the seasonal abundance of these anophelines is never so marked as is that of members of other groups (*Anopheles minimus*, *A. aconitus* and *A. vagus*), or of *A. maculatus*. *A. fuliginosus* and *A. philippinensis* are apparently summer monsoon species, which are scarce in the second portion of the winter monsoon. *A. maculipalpis*, which showed a slight increase in numbers during the intermediate seasons (April and October), was, at least in the larval stage, moderately abundant at other times. E. E. A

MORIN (Henry G. S.) & BADER (H.). Recherches sur quelques facteurs physico-chimiques de l'écologie des larves d'anophèles au Tonkin. [**Physico-Chemical Factors in the Ecology of Anopheline Larvae in Tonking.**]*—Ann. Inst. Pasteur.* 1933. Nov. Vol. 51. No. 5. pp. 656-668. With 1 map in text.

In Indo-China hilly regions are more malarious than low-lying deltas, since *Anopheles minimus*, *A. maculatus* and *A. jeyporiensis*, the principal local vectors, breed almost exclusively in clean running water. The object of the investigations summarized in the present paper was to determine whether the chemical composition of the waters in the unhealthy region includes some common feature distinguishing them from those in the healthy zone. The data obtained showed much seasonal variation, so that for their full interpretation more prolonged research is necessary.

As already shown by a number of other workers, the majority of Anophelines are relatively tolerant of fairly considerable variations in

pH, and a high degree of mineralization is not *per se* and invariably an obstacle to breeding. On the other hand the determining favourable factor appeared to be the presence in the water of a certain quantity of CO₂ gas in a state of free solution. The term "carbonic index" is introduced for the figure representing, in milligrammes of CO₂ per litre for a given sample of water, the excess of free and half-dissolved carbonic acid over the potential CO₂ content, the method of determining which is described.

During two years from March 1931, more than four hundred samples of water from different sources were examined; the purest, such as those from springs in the upper region, were found to have the highest indexes, while in the dry season stagnant water from pools in the low-lying delta proved practically negative in this respect. Springs and rapid streams are the chief centres of *Anopheles*-breeding in Tonking; these have a high carbonic index, and there is thus a curious parallelism in this respect. Should it prove that seasonal variations in the carbonic index affect the predominance or the reverse of a given malaria-carrying species, a factor of probable importance in particular outbreaks of the disease would have been discovered, and might perhaps in certain cases be modified.

E. E. A.

DE MEILLON (B). *Distribution of A. gambiae and A. funestus—Union of South Africa. Ann. Rep. Dept. of Public Health Year ended 30th June, 1933. Annexure D. pp. 61-64.*

This excellent report is a summary of the author's findings.

A. funestus breeds in the permanent streams which have their origin in the Drakensberg. The population of this species is therefore stable, and this is reflected by the intensity of malaria where it predominates, as well as by the absence of epidemics. *A. gambiae*, in direct contrast, shows great fluctuations which depend on the rainfall, because it breeds in small temporary pools. When there is an abnormally heavy rainfall, epidemics of malaria arise in districts where the disease is rarely seen and where *Anopheles* are seldom found. In South Africa epidemics of malaria are always associated with *A. gambiae*. In dry weather this species breeds in quiet, exposed backwaters of rivers; *A. funestus* breeds in shaded portions where there is a current. The prevalent idea that the larvae of *A. gambiae* can resist desiccation in dried mud is not correct. This mosquito is not a frequenter of houses to the same extent as *A. funestus*, it shelters under damp stones, in crevices and hollows.

A. funestus is a house frequenter. One which enters a house with its eggs undeveloped remains there until they are ripe, and in the meantime it feeds repeatedly. This explains the high rate of infection in this species. It feeds indoors, not out of doors. Above 2,500 feet, its habits change. Though larvae are numerous up to 3,500 feet, the mosquitoes do not enter houses, and there is no malaria (see ROUBAUD *ante*, p. 424). As regards range of flight, 80 per cent. of this species remain within a half-mile radius, but both males and females may occur as far as two miles from their point of origin. The author has recorded a flight of 4½ miles when no nearer source of human blood was available.

Spraying a hut with insecticide at 8 p.m. did not prevent *Anopheles* entering in the early morning. An application of citronella is not sufficient to last all night, its repellent effect passes off in about 5 hours.

W. F.

SCHAPIRO (Louis). **Observations and Experiments on Mosquito Breeding in Pit Latrines in Panama.**—*Amer Jl Hyg* 1934 Jan. Vol. 19. No 1. pp 254-259.

To test whether pit latrines, which, as employed in Panama, play an important part in the campaign against ankylostomiasis, are breeding places of *Anopheles* and thus concerned in the spread of malaria, twenty-six such latrines in La Chorrera and other cities were inspected. *Anopheles* were not found.

All but one were in use, and the majority from a quarter to half full of water. The mosquitoes collected, either emerging from the pits or on the walls, included specimens of seven species of *Culicines*, but not a single *Anopheles*. The results of an attempt to breed out larvae of the latter genus, placed under laboratory conditions in dilutions of faeces of various strengths, were not altogether conclusive. Those in strong dilutions perished within 48 hours, with three exceptions, in which all larvae died, those in weaker dilutions lived longer and, except in one instance, gave rise to a varying percentage of adults. It is concluded that "the pit latrines used in Panama are not important breeding places for *Anopheles* mosquitoes." According to a footnote, it has been found by experience that "six ounces of diesel oil applied every ten days to a latrine pit 2 feet long by 3 feet wide by 10 feet deep effectively controls mosquito breeding,"
E. E. Austen.

PAVLOVA (P. I.) **Artificial Alteration of the Active Reaction of Water Reservoirs for the Control of the Larvae of the Malaria Mosquito.**—*Med. Parasit. & Parasitis* are. Moscow 1932. Vol 1. No. 5-6. pp. 265-266. [Fae Asian.] [Summarized in *Rev Applied Entom.* Ser. B. 19green feb. Vol. 22. Pt. 2. p. 21.]

"In the summer of 1932, field experiments were carried out near Moscow on the control of *Anopheline* larvae [*Anopheles maculipennis*, Mg.] in pits in peat-bogs, etc., by modifying the hydrogen-ion concentration of the water and comparing the results with those obtained with oil and Paris green. The larvae were destroyed when the pH of the water in the pits was reduced to 1.9 by the addition of sulphuric acid, and this figure was approximately maintained for about two months in pits with a clay bed. In those having a sedge-peat bed, however, the action of the acid was neutralised in a comparatively short time by the alkaline reaction of the peat, after which the mosquito larvae again occurred."

BEKLEMISHEV (V. N.). **Whence come Adult Anophelines in Areas that have been subjected to Avio-Chemical Treatment?**—*Med. Parasit. & Parasitic Dis.* Moscow. 1933. Vol. 2. No. 1-2. pp. 53-59. With 1 graph. [In Russian.] [Summarized in *Rev Applied Entom.* Ser. B. 1934. Feb. Vol. 22. Pt. 2. p. 37.]

"In a rice-growing area to the north of Lake Balkash in south-eastern Kazakhstan, Paris green was applied by aeroplane to all the rice-fields and adjoining marshes, etc., at intervals throughout the summer of 1932 for the control of *Anopheles maculipennis*, Mg. In August, however, adults of this mosquito were present in all villages, though no larvae could be found. The mosquitos were most numerous in the houses nearest to the rice-fields, and so had almost certainly not come from some other breeding-place that had been overlooked during the

dusting operations. The preceding applications of dust had been made on 19th July and 10th August, and by calculating the duration of the life-cycle of the mosquito in comparison with the average temperature of the water, it was evident that a generation had matured in the interval, the pupae being unaffected by the dust. The maximum duration of the life of the females in August in this district was found to be 20 days. In a neighbouring district where dust applications in August had been correlated with larval development, hardly any adult Anophelines occurred from September to the end of the year. In districts where control was not applied, the mosquitos were abundant in houses in September and malaria was severe. It is concluded that the position of breeding-places can be determined from the places in which adult mosquitos are found in the day-time."

MORIN (Henry G. S.) with the collaboration of P. MARTIN. Possibilités d'utilisation pratique du vert de Paris en Indochine. [The Use of Paris Green in Indo-China.]—*Arch. Insts. Pasteur d'Indochine*. 1933. Apr. No. 17. pp. 103-140. With 4 plates (2 folding). [49 refs.]

The author prefers oil to Paris green as a larvicide in Indo-China, where anopheline breeding and malaria are continuous throughout the year, and the labourers available are quite uneducated.

The author deals first with the principles of the use of Paris green, which is aceto-arsenite of copper, a by-product of various metallurgical industries. It should be completely soluble in ammonia, and should contain from 50 to 55 per cent. of arsenious anhydride. As it is insoluble in water, it must be fine enough to pass into the digestive tubes of the larvae, and light enough to float on the surface of the water where they feed. The mouthless pupae and the minute first and second stage larvae which are too small to swallow it are unaffected by Paris green. The author employed a 1 per cent. mixture, and he found that the most effective diluent in Indo-China consisted of 9 parts of road dust with 1 part of powdered wood charcoal; this diluent itself was lethal to larvae. It is one of the advantages of Paris green that it can be applied to extensive lakes, marshes, and flooded areas without the clearing away of weeds and algae, which is a necessary preliminary to the application of oil. Paris green when applied to water in the proportion of 1 litre of a 1 per cent. mixture to 100 square metres of surface, does not make the water poisonous, either for the animals which drink it or for the fish which live in it. It is transformed by contact with the flora of the water into volatile ethylarsine, and, consequently, successive applications produce no accumulation of arsenic. For a man to consume the minimal fatal dose of 0.005 grams of arsenic, it would be necessary for him to swallow 240 litres of the treated water, or to eat 44 kilograms of the fish caught in it. The labourers who apply the Paris green should wear special clothes while at work, and should change and wash before eating. They should never touch the undiluted powder with bare hands. Anyone found, by the occurrence of eczema, to be particularly susceptible to arsenic should be taken off the work.

One of the disadvantages of Paris green is the difficulty of checking its applications, for, unlike oil, it leaves no visible film, and its traces in the water are so minute as to defy detection by ordinary chemical means. According to HACKETT, a few cubic centimetres of the treated

water give off a characteristic smell of garlic if they are added to a culture of *Penicillium brevicaulis*.

Oiling is the method of larval control generally adopted in Indo-China, and the author doubts whether Paris green is as suitable in a country where malaria is not an affair of seasons but is continuous from year's end to year's end. Any disturbance of the water causes the Paris green to sink, and, should it rain within 5 hours of its distribution, it must be re-applied. Another objection which he raises is that the labour available is neither sufficiently educated nor sufficiently trustworthy to handle a poisonous substance with efficiency and safety.

The distribution of Paris green by an aeroplane has been found efficacious in the case of an aviation camp at Tong, and the author thinks that this method may be very useful for protecting temporary concentrations of soldiers on active service, or possibly as an immediate preliminary measure under other conditions. W. F.

MORIN (Henry G.), BADER (H.) & MARTIN (P). Sur le mode d'action larvicide du vert de Paris. [How Paris Green acts.]-*Bull. Soc. Path. Exot.* 1933. Dec. 13. Vol. 26. No. 10. pp. 1267-1273.

Paris green contains arsenites and arsenates. The arsenites are more important. A method of assay is given.

The larvicidal properties of Paris green are due to the arsenic which it contains. But this is present in two forms the arsenite and the arsenate of copper. Arsenites are slightly more toxic than arsenates for man, and the authors have carried out experiments with larvae which show that the arsenites are much the more powerful form for destroying anopheline larvae. The usual method of determining the arsenic content of Paris green in terms of the trioxide is therefore insufficient. The authors give details of a method by which the arsenite content can be determined. W. F.

MACKAY (R.), BUCHANAN (J. C. R.) & SANDERSON (I). Arsenical Poisoning associated with Larvicidal Treatment of Water with Paris Green.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934. Mar. 12. Vol. 27. No. 5. pp. 517-523.

Paris green applied in the usual way caused an outbreak of arsenical poisoning among the Tanganyika natives who used the treated water.

The authors note the rarity of recorded poisoning after the use of Paris green and the similarity of the symptoms to those of some dietetic deficiency. Their treatment of eight water-holes and a weed-covered pool once a week over a period of 3 months resulted in the illness of 132 persons.

The green was stated to contain 55.37 per cent. arsenious oxide and 1 per cent. water soluble arsenic. It was at first applied by blower, then by hand, a handful of the one per cent. mixture with powdered red earth and sand being dusted over each water-hole, 5-8 feet in diameter [depth is not stated].

Symptoms appeared after a minimum period of 3-5 weeks, but their significance was not at first appreciated. They were in order of relative frequency.

"A sensation of burning and tingling in the soles of the feet, generalised itching of the skin, paraesthesias of the palms similar to those felt in the feet, pains in the limbs, abdominal pain, diarrhoea, burning and watering

of the eyes, oedemas and, in one case, fever. These, in a variety of combinations, made up the clinical picture of the milder cases, and to them were added later desquamation, paresis, keratosis, bronchial affections, herpes and lastly, but fortunately rarely, paralysis."

These symptoms are then discussed, burning feet as the commonest indication of something wrong; intense itching of the skin as the first symptom in 20 per cent; gastro-intestinal disorders as not prominent, oedema with pitting over the tibiae in 15 per cent.; desquamation beginning about the third week, and at times so severe as to merit the term exfoliation and giving a striking appearance to the natives not unlike the depigmentation of mycotic infections, paresis in the extensors of arms and legs in 9 per cent. Arsenic was readily detected in the urine, as also in water from the water-holes a week after the last application.

A. G. B.

HACKETT (L. W.). **Arsenical Poisoning with Paris Green.** [Correspondence.]—*Trans. Roy Soc Trop Med. & Hyg.* 1934. May 9. Vol. 27. No. 6. p. 628.

Commenting upon the above paper Dr. Hackett writes that no one with any experience would dare to recommend the hand-dusting of Paris green on small collections of water used for domestic purposes; blowers should be used because only in this way can the proper dose (1-2 decigrams per sq. met.) be applied. Tons of the green are being used every summer in Italy and other Mediterranean countries and no word of poisoning of man or beast has reached Hackett. The incident described by MACKAY *et al* is probably due "to carelessness in throwing about a poisonous substance without scientific control of the dosage."

A. G. B.

BOETTGER (Caesar R.). Ueber die Artzugehörigkeit des in Italien zur Malariabekämpfung eingeführten Zahnkarpflings [**Species of the *Gambusia* introduced into Italy in the Antimalarial Campaign.**]—Reprinted from *Zool. Anzeiger*. 1933. Vol. 105 No. 1/2. 14 pp. [21 refs.]

There are three species of *Gambusia* in U.S.A. an easterly species, *holbrooki*, on the rivers which flow to the Atlantic, a central, *patruels*, on the Mississippi system, and a western, *affinis*, in Texas. The author reaches the conclusion that for the species introduced into Italy the name *Gambusia holbrooki* Girard should be replaced by *G. patruels* Baird and Girard. A useful list of references is appended.

A. G. B.

PRENDEL' (A. R.), ZAGOROVSKIĖ (N. A.) & FUTRAN (G. S.) **Data on the Acclimatisation of *Gambusia* in the U.S.S.R.**—*Med Parasit. & Parasitic Dis.* Moscow. 1932. Vol. 1. No. 5-6. pp. 261-264. [10 refs.] [In Russian.] [Summarized in *Rev. Applied Entom.* Ser. B. 1934. Feb. Vol. 22. Pt. 2. pp. 20-21.]

"An account is given of observations in Odessa in 1930-32 to determine whether *Gambusia* can thrive under the climatic conditions of southern Ukraine. Notes on its biology are included. It was found that the fish can survive the winter (in a pond in which the water was covered with ice for 3½ months), and multiply in large numbers during the summer and autumn without being given artificial food. They

lived for several months in water the salinity of which was gradually increased from 0.5 to 1.5 per cent., but died in a few days in water containing 2 per cent. NaCl. They also lived in naturally brackish water in drainage ditches, in which the salt content did not exceed 0.6 per cent. This power of adaptation to brackish water is of special importance on the north-western coast of the Black Sea, where the stagnant water in which mosquitos breed in spring often becomes brackish in summer."

YOUNG (T) **Quinine Prophylaxis in Northern India.**—*Jl. Roy Army Med. Corps.* 1933. Aug, Sept., Oct, Nov. & Dec. Vol 61. Nos. 2, 3, 4, 5 & 6. pp. 90-98; 180-184; 262-267, 330-339; 412-426 With 1 chart. [54 refs]

These experiments demonstrate the value of quinine prophylaxis in a country where the malaria season is limited to a short period of about 8 weeks in the year.

The observations were made in Nowshera for the first two years, and were subsequently extended to other districts. The period of infection in Nowshera begins in the middle of September and ends in the first week of November. The same is more or less true of the other stations to which the experiment was extended. In ordinary years malaria is mainly benign tertian, but when epidemics occur, subtertian is more common. The dose of quinine employed for prophylaxis was ten grains of the sulphate in solution every evening, except Saturday evening, for three weeks. In 1926, this treatment was given to the English troops at Nowshera from October 4 to 24. The quinine group consisted of 210 men; during October, there were 17 cases among them, or 81 per thousand. In the control group of 225 men, there were 68 cases, or 302 per thousand.

In 1927, both British and Indian troops were treated, and two courses of three weeks each were given, with a ten days' interval between them. The results were as follows:—In the British quinine group consisting of 194 men, there were 6 cases or 31 per thousand, in the control group of 270 men there were 26 cases, or 96 per thousand. In the Indian quinine group of 443 men there were no cases of malaria, and in the control group of 441 there were only 9 cases.

In 1928, other units in Peshawar were included. In cantonments, there was so little malaria that the test was of no value; but in the Chitral Relief Column, the quinine group which was about 500 strong had 3 cases of malaria, while the control group, consisting of some 3,200 men, had 83 cases.

The year 1929 was the worst malaria year in the records of the district. Among 473 British troops on quinine, the incidence of malaria was 2 per thousand during the first 3 weeks' course and 142 per thousand during the second. In the control group of 228 men, it was 39 during the first period and 211 in the second. During the six weeks after the quinine had been stopped, the incidence in the two groups was approximately equal. With Indian troops the prophylactic treatment was equally successful and the amount of malaria among those taking quinine was considerably less than among those forming the control.

"Throughout all stages of the experiment, there was a definitely reduced incidence of malaria and a definitely lower ratio of admissions to hospital for all causes among those taking quinine." The cost of the quinine was a little less than one rupee per man. Apart from its

taste, the treatment was popular. The bitter taste is a serious obstacle in the way of efficient prophylactic treatment, and tablets were substituted with satisfactory results in the case of the Chitral Relief Force. [The tablets made by responsible firms are quite trustworthy, as an alternative gelatine capsules may be used.] No ill effects attributable to quinine were noticed during the course of the experiment. The 10 days interval between the two courses has now been found unnecessary and has been abandoned. The author concludes that in non-epidemic years the prophylactic treatment is hardly worth the cost and labour involved, but in epidemic years the outlay is amply repaid. He intended to continue the experiments in 1930, but the authorities refused to allow the use of controls, on the ground that the case for quinine prophylaxis had been completely proved, and orders were received to issue 10 grains of quinine, 5 days a week, for ten weeks, from the beginning of September to the middle of November, to all troops in malarious stations. W. F.

MISSIROLI (A) & MARINO (P). Anwendung des Chinoplasmin zur Malariasanierung. [**Quinoplasmoquine in Malaria Control.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934. Jan. Vol. 38. No. 1. pp 1-16. With 8 figs.

Observations made in a hyperendemic malaria area in Sardinia to determine the value of quinoplasmoquine in controlling malaria.

The place selected was Torpé, Sardinia, a district of 1,200 inhabitants, in which the malaria was hyperendemic, as determined by the spleen and parasite index. The dose of plasmoquine was 2 cgm. for adults with reduced doses for younger persons, it was given as quinoplasmoquine (quinine 0.3 gm, plasmoquine 0.01 gm.), as the quinine would act on the schizonts, whilst the plasmoquine acted on the gametocytes. The entire population received plasmoquine for 10 days in April and in June. During the course of the treatment cases of the following occurred—Blackwater fever 1, jaundice 9, gastralgia 14, metrorrhagia 3, fainting 7. It was not possible to say whether the blackwater fever was caused by the quinine or the plasmoquine. The authors refer to the work of BARBER, KOMP and NEWMAN [this *Bulletin*, Vol. 26, p. 939] on the effect of small doses of plasmoquine in preventing infection of anopheles, and they have developed it further. [They do not refer to the work of CLEMESHA and MOORE [*loc. cit.*, Vol. 28, p. 576], who reach the conclusion, after 5 years experience of anti-malarial measures on Travancore Tea Estates, that anti-gametocyte campaigns with quinoplasmoquine can be easily carried out with success on estates, but that "*such a thing is practically hopeless with a civil population.*"] As a result of their investigations in a hyperendemic malaria area in Sardinia the authors reach the following conclusions:—(1) The administration of plasmoquine in 2 cgm. doses for adults and proportionately smaller doses according to age, in the form of quinoplasmoquine, given every second day to the entire population of an agricultural area of Sardinia, proved harmless. (2) During the period of treatment the percentage of infected anopheles fell to zero; in the control area it rose to over 2 per cent. (3) During the same period the incidence of malaria in the villages treated with plasmoquine fell markedly. (4) Treatment for 10 to 20 days with plasmoquine during the pre-epidemic period showed no effect on the course of the subsequent epidemic.

E. D. W. Greig.

- SOESILO (R). **Atebrin in Malaria Prophylaxis. Preliminary Report.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934. Jan 31. Vol 27. No 4 pp 421-423
- & GILBERT (A. Ph W.) Over causale prophylaxis en therapie met atebrin (tweede mededeeling). [**Causal Prophylaxis and Therapy with Atebrin. II.**].—*Geneesk. Tijdschr v Nederl-Indie* 1934 Feb 27. Vol. 74. No. 5. pp. 271-273

The definitely prophylactic results obtained with atebrin were —

(a) Twenty-one volunteers in Java, prophylactically treated with 0.1 or 0.2 grams of atebrin, were bitten 5 or 24 hours later by mosquitoes infected with tertian malaria. Six of them developed parasitaemia in 12 to 24 days with fever in 15 to 24 days. The remaining fifteen showed no sign of infection for 14 months, the period of their observation

(b) Ten out of 11 control persons, who had received no atebrin had parasites in their blood in 8 to 13 days and fever 10 to 14 days after being bitten.

The trials of curative treatment were carried out on 17 volunteers infected with malaria with a dosage of one 100-mgm. tablet thrice daily for 5 to 6 days. Four persons began treatment before the temperature had risen and thirteen after. The preliminary report gives the results of observation over a period of 8 months, and the second communication extends this period to 12 to 17 months. The results were —

(a) Fourteen persons showed neither schizonts nor gametes

(b) One of the treated developed parasitaemia and pyrexia in about 2 months. A second showed parasites again 36 days after cure. A third developed parasitaemia and fever one year after treatment

Naturally acquired tertian malaria was also treated in 6 cases with the same dosage of atebrin for 5 days. After 3 days use of atebrin schizonts and gametes disappeared. Five patients have remained for 12 months after the last atebrin dose free of malaria. The sixth developed malaria relapse 9 weeks after the treatment but has since remained free

W. F. Harvey

- KASSIRSKY (J. A.), BUROWA (C. F.) & UMIDOWA (S. J.). Beitrage zum Studium des Zirkulationssystems bei der Malaria. [**Circulatory System in Malaria.**].—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934. Feb. Vol 38. No. 2. pp. 66-74 With 8 figs.

A clinical study of the effects of malaria on the circulatory system as seen in cases in central Asia. In all 45 cases were studied.

E. D. W. Greig

- LAJOS (S.). Ueber die Anwendung des Atebrin bei Malaria tertiana. [**Atebrin in Tertian Malaria.**].—*Muench. Med. Woch.* 1934. Jan 5. Vol. 81. No. 1. p. 22.

Describes the treatment of three cases in Hungary.

A. G. B.

- SCHWETZ (J.), BAUMANN (H.), PEEL & DROESHAUT. Sur la proportion des trois espèces malarieuses trouvées chez les enfants noirs de la consultation des nourrissons à Stanleyville (Congo belge). (On the Proportion of the Three Species of Malarial Parasites among the Native Babies of the "Consultation des Nourrissons" of Stanleyville (Belgian Congo).)—*Riv. di Malarologia.* 1933. Sept-Oct. Vol. 12. No. 5. pp 888-896. English summary p 1064.

- SWEET (W C) , Rao (B. A.). Notes on Malaria in Mysore State Part I The Topography, Meteorology and Malarial Seasons of Mysore [SWEET] — *Records of the Malaria Survey of India* 1933 Dec Vol 3 No. 4. pp 635-661. Part II The Anophelines of Mysore State [SWEET].—*Ibid* pp 663-674. Part III. Spleen and Parasite Rate Relationships [SWEET].—*Ibid*. pp 675-687. Part IV. Experimental Control of Malaria with Paris Green and Plasmoquine [SWEET & Rao].—*Ibid* pp 689-718. With 4 graphs
- TOULLEC & MOREAU. Essais de traitement par l'*atêbrine* sur des cas de paludisme quinine-résistant de la Haute-Région tonkinoise — *Bull. Soc. Méd.-Chirurg Indochine* 1933 Sept Vol 11 No 6 pp. 723-736
- TUNISIE MÉDICALE 1933 Sept-Oct Vol 27. No 8. pp. 309-372 With 6 figs on 3 plates — Numéro consacré au paludisme (1er partie). [4 papers]
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BERIBERI AND EPIDEMIC DROPSY.

ANDRÉ (L.) L'étiologie du bérubéri (à propos de quelques cas observés en Chine) [**Etiology of Beriberi.**].—*Arch Méd et Pharm. Nav.* 1933. July-Aug.-Sept. Vol 123. No 3. pp 508-532. [33 refs]

Conclusions are drawn concerning the etiology of beriberi from a study of cases seen in China

After reviewing in detail the whole subject of beriberi etiology the author draws the following conclusions.—The disease is not a pure avitaminosis and a study of acute cases, as seen for example in an outbreak at Hankow in 1929, shows clearly that it has the characteristics of an infectious malady. BERNARD'S B. Asthenogenes is responsible for the toxi-infection character of beriberi. This organism acts more powerfully when the resistance of the patient is lowered as, for example, by a diet deficient in vitamin B. Three etiological factors are present, viz., the infecting organism, a faulty gastro-intestinal condition associated with carbohydrate fermentation and a lowered resistance.

As a result of these views the following measures are suggested — Patients should be isolated and subjected to an antiseptic regime of the gastro-intestinal tract. Care should be taken that decorticated rice is not given in large quantity and, if need be, it should be suppressed altogether. Food rich in vitamin B, or better still vitamin preparations as issued in the Dutch East Indies, should be given.

A. D. England.

YANG (Chi-Shun) & HUANG (K. K.). Beriberi in Nanking.—*Chinese Med J* 1934. Jan. Vol 48 No 1. pp. 20-36. [29 refs]

A review of beriberi based upon 109 cases in Nanking.

Among the conclusions the following points may be mentioned :— Over 64 per cent of the cases were in the age group 20-29. 43 per cent. of cases followed a febrile illness, usually malaria. The highest incidence of the disease was in July, August and September, coinciding with the seasonal incidence of malaria. It was found that the oedema of beriberi is not associated with lowering of the serum proteins. Two instances of cerebral oedema were recorded and transient hypertension is thought to be due to an increase of intracranial tension. The etiological importance of excessive muscular work in persons living on a deficient diet is stressed and the use of mercurial diuretics (salyrgan and novasurol) in the treatment of oedema is recommended.

A. D. B.

CRUZ (Alberto). Beri-beri—alguns dados, principalmente epidemiológicos, no surto da cidade de Campos—1932-1933. [**Epidemiological Factors in the Outbreak of Beriberi in Campos (Rio de Janeiro), 1932-1933.**].—*Arch. Brasileiros de Med.* 1933. Dec. Vol. 23. No. 12. pp. 325-347.

The first cases made their appearance in November 1932 and in about 7 months there were 434 known cases. Of this total 211 were recorded in the town, Campos, itself, 189 in the rural zone, 32 in other municipalities. It is highly probable that the total exceeded five hundred. Of the 211 in the town 192 lived on the right bank of the

River Parahyba and only 19 on the left bank. Tables are presented to show the distribution by race (colour), age and sex. Of the 434 there were 236 white, 125 mulatto and 64 black (9 not mentioned), 307 were males and 127 females, most (252) were between 20 and 40 years of age, the same number, 126, in each of these decades. Unless any of the 6 whose ages are not stated were under 10 years, there were none below this age. There were 16 fatal cases, 8 in the town among 211 (3.9 per cent), 4 in the rural districts (2.1 per cent.), 4 others occurred in the hospital for beriberi. A list is given of the various articles of food in use and their nutritive value as estimated by CHICK, HUME and COOPER some 20 years ago. The remainder of the article is taken up by rather desultory discussion. H. H. S.

TÓMASSON (Helgi) **Beri-Beri in Iceland.**—Reprinted from *Acta Psychiat et Neurol.* 1933 Vol 8 No. 1-2. pp. 31-35

An account is given of a small epidemic of beriberi occurring in the Westman Isles, Iceland.

Sixteen cases of beriberi were observed during the fishing season (beginning of January—middle of May). The clinical appearances were typical and it is interesting to note that the calf muscles were often swollen and tender as a result of intracellular water-retention (see abstract of paper by GOIRAN in this issue). The usual cardio-vascular signs were noted and Aalsmeer's adrenaline test gave strongly positive results. Treatment with yeast was successful.

The diet of the Icelanders has undergone considerable alteration during recent years. No longer is milk an important part of the food and the old rye-cakes have been largely replaced by white bread. Of the cereals, polished rice and oatmeal, both poor in vitamin B₁, are mostly taken and potatoes are the only vegetable in general use. Fish is a constant food, but fresh meat is only eaten occasionally by the poorer classes. Conditions in these islands correspond with those found in Newfoundland and it is agreed that fresh fish, even in relatively large quantities, is an insufficient source of Vitamin B₁. A. D. B.

KOLKA (P. V. G.). **Beriberi í Vestmannaeyjum.** Brádabirgdar-skýrsla. [**Beriberi in Westman Islands.**]—Reprinted from *Læknabladid*. 1933. 6.-8. tbl 18 pp. [25 refs.] English summary.

Four cases of anaesthetic polyneuritis of the lower extremities with cardiac symptoms are described. The patients were all fishermen in an Icelandic fishing village. Their diet was definitely deficient in Vitamin B. The disease was cured in a very short time by the use of yeast and diet improvement. It is concluded, therefore, that the condition was beriberi. A. D. B.

ELSHOUT (J. M.) & LENTJES (L. J. M.). **De beri-beri epidemie op het eiland Onrust.** [**Epidemic Beriberi on the Island of Onrust.**]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1933. Oct. 10. Vol. 73. No. 21. pp. 1288-1298.

An epidemic among naval prisoners on an island off Holland.

A number of European and native sailors were placed as prisoners on the island of Onrust, at the mouth of the Zuider Zee on 12th February. On 19th March the first two cases of beriberi were diagnosed. By 12th April the number of cases had risen to a maximum of

56. The type of the disease was mild and symptoms complained of were weakness in the bones, paraesthesiae, cramps in the calf muscles and difficulty in walking. A stamping gait with stiff legs, the heel first to the ground and knee in slightly recurved position was the common gait. Only one patient showed a typical cock walk. Slight oedema was present over the tibia; achilles and patellar reflexes disappeared. Shortness of breath and palpitation were scarcely complained of. In fact cardiac symptoms were slight—some enlargement of the right heart, a quick reacting pulse, a normal blood pressure, and in some cases a vascular murmur especially over the crural artery. The therapeutic measures taken were, the allowance of a more varied diet (Katjang idjoe, more fresh vegetables, etc.), amelioration of the rigorous imprisonment, more exercise, gymnastics, more fresh air and games. It is natural to look to the feeding as the cause of this epidemic, but the authors dismiss this suggestion as untenable. The food, in so far as it involved a change of previous diet, was merely one from a more liberal to a more frugal one and from white rice to the silver-husk rice of the Army Service Corps. Other factors must be sought whose combined action was sufficient to precipitate beriberi, in spite of the protection of otherwise good food. The factors which are suggested are the imprisonment, insufficiency of exercise, confinement and psychic depression. The question, however, is raised whether the diet in the Dutch navy generally is sufficiently prophylactic against beriberi in times of stress.

W. F. Harvey.

WEST (Augustus P.) & CRUZ (Aurelio O.). **Philippine Rice-Mill Products with Particular Reference to the Nutritive Value and Preservation of Rice Bran.**—*Philippine Jl. Sci.* 1933. Sept. Vol. 52. No. 1. pp. 1-78. With 1 fig. & 10 plates. [70 refs.] [Summary appears also in *Bulletin of Hygiene*.]

The average yearly production of paddy (unhulled) rice in the Philippines is two million metric tons. In the Philippine process of milling the rice is passed through a huller, the hulls are used in the boiler, and the rice is polished, in which process the bran, consisting of the entire seed coat and the embryo as well as most of the aleurone layer is removed. Polished rice usually contains remnants of the oily aleurone layer, and the oil tends to become rancid when the rice is stored for some time. Rice starch is used in laundering, preparing foods, making pastes, medicinal tablets and cosmetics. Rice hulls are used for fuel, packing hygroscopic materials, filtering, and the ash makes good polishing powders. Polished rice keeps much better than, and does not become infested with insects as does unpolished rice. The fats, proteins and vitamins of the paddy rice are contained chiefly in the bran. High-grade, moisture-free bran should contain at least 20 per cent. of vegetable oil. For human consumption the bran should contain practically no hulls as they irritate the intestine, and in milling a very efficient blower should be used. The presence of hulls in the bran can be determined microscopically.

The proteins of rice-bran are similar to those of meat and milk and soy-bean; their biological value compares favourably with those of meat. The bran contains an excess of phosphorus as compared with lime and in this respect is unbalanced. In other respects it is an excellent food, being more nutritious than hydraulic copra cake, wheat bran, Graham and straight grade flour. If its natural flavour is

objected to, this may be toned down by mixing with wheat flour; 3 parts of wheat flour and 1 of bran make a good mixture for bread and cakes. The bran does not contain gluten and the wheat flour remedies this deficiency. Beriberi is a very common disease among the poor of the Philippines and for this reason the vitamin B₁ content of the bran assumes special importance. The yield of tiktiki extract from bran varies considerably; the potency of 1 cc. of the standard extract is that of 14.5 gm. of high-grade rice bran. It has been estimated that for people who are susceptible to beriberi 30 gm. of rice bran daily provides sufficient vitamin B₁. The annual production of rice bran in the Philippines is about sufficient for all the people requiring it for its medicinal value and for others who might possibly benefit from its use.

Deterioration of rice bran is caused by insect infestation, and also by hydrolysis of the rice oil in the presence of moisture, due to the lipases present in the vegetable tissue. This decomposition causes a disagreeable taste. The authors' results indicate that the best method for preserving the bran is to heat it at a temperature of about 105°C. for 3 hours and then keep it in moisture-proof packages, for which cellophane is the best material. The vitamin content is not affected by this process, and the lipases only appear to be rendered inactive, for if moisture gains access hydrolysis commences. Heating at 120°C for 6 hours appears to destroy the enzymes. In preparing rice bran for storage a cooker containing a stirrer should be used as stirring assists the removal of moisture; the bran should be packed whilst hot. Where proper facilities are not available, the bran may be heated, with continual stirring, in a frying pan over a low fire until the bran turns slightly darker in colour; it is then placed in a can or glass jar which must be closed tightly. The bran will then keep in good condition for a week or more. The heated bran has a more pleasant flavour than the fresh raw bran. In the Philippines, fine rice bran is very cheap and is used chiefly for feeding cattle and poultry. For the poorer classes, whose diet is principally polished rice, the use of rice bran would remedy to a considerable extent the present deficiencies in fats, proteins and vitamins. It would prevent beriberi and improve the general health, and at the same time develop the natural resources of the country.

H. N. H. Green.

VAN VEEN (A. G.). Der Einfluss des Waschens und Daempfens auf den Gehalt an vitamin B₁ von Reisproben verschiedenen Schleifgrads. [**B Vitamin Content of Rice of Different Degrees of Polish after Washing and Steaming.**].—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië*. 1933. Vol. 22. No. 3. pp. 181-189. [10 refs.]

The author holds the view that in the Dutch East Indies too much attention is paid to the degree of polishing of rice as indicative of its vitamin content whereas, as a matter of fact, the after-treatment of rice (cooking, steaming, etc.), is of even greater importance in this respect. [For details see page 19, *ante*.]

A. D. B.

ISWARIAH (V.) & KUTUMBIAH (P.). **Post-Puerperal Polyneuritis.**—*Indian Med. Gaz.* 1934. Jan. Vol. 69. No. 1. pp. 13-16. [13 refs.]

Peripheral neuritis occurring in women during the puerperium is described and the possible association of the condition with beriberi is discussed.

From a full examination of the literature it appears that peripheral neuritis is not a commonly recognised complication either of pregnancy or of the puerperium. 24 cases observed in Vizagapatam, an endemic area of beriberi, showed typical peripheral neuritis with oedema beginning 2-3 months after labour. The women were otherwise apparently healthy and the condition occurred most frequently in primiparae. The infants in about 70 per cent of the cases were healthy and suckled by the mother. There was only one maternal death in the series.

When compared with male beriberi admissions at the same time the remarkable absence of cardiac symptoms in the women suggested that beriberi was not the cause of the outbreak. Though the strain of childbearing may render an unbalanced diet insufficient, the authors suggest that some endocrine disturbance may be responsible. Nevertheless, the fact that such outbreaks only occur in areas where beriberi is endemic cannot be overlooked.

A. D. B

AALSMEER (W. C.). Over de wijze van ontstaan van het vaatsyndroom en de verklaring van het adrenalineffect bij beri-beri. [Mode of Development of the Vascular Syndrome and Explanation of the Adrenalin Effect in Beriberi.]—*Geneesk. Tijdschr. v. Nederl-Indië*. 1933. May 23. Vol. 73. No. 11 pp. 659-668. [14 refs]

Numerous papers have appeared on this subject by AALSMEER and by WENCKEBACH himself (this *Bulletin*, Vol 25, p. 871; Vol 26, pp 352, 517; Vol 28, p. 460; Vol. 29, pp. 92, 614 and Vol. 30, pp. 159 and 543). The importance of the vascular symptoms in beriberi lies in their hydrodynamic explanation and the suitability of this disease for testing various hypotheses. What is the cause of the rapid, bounding (*celer et altus*), and rippling pulse, the presence of vascular murmurs, the fall of the minimal or diastolic blood pressure and the capillary pulse? These phenomena are not peculiar to beriberi but are manifest also in arteriovenous aneurysm, exophthalmic goitre, aortic insufficiency and severe anaemias. An explanation has been found, especially through the work of BRAMWELL, in the character of the wave front in the aorta—its self dependent on the increased volume of blood expelled by the heart, the decreased expulsion time and the low diastolic pressure—and in the rapidity of peripheral discharge ("leak"). The sum total of the different factors concerned is described under the word "gradient," expressing the fact that the rapidity of development of the fall and an unstable wave front are the most important factors concerned in the vascular syndrome. The gradient becomes an index of the degree of vascular symptoms. Adrenalin effect is attributable to its pharmacological action on the heart and not to its action on the blood vessels. Adrenalin accentuates the syndrome by increasing the steepness of the "gradient."

W. F. Harvey.

GOIRAN. Altérations musculaires particulières au cours de poly-névrites bérubériques. [Muscle Changes Peculiar to Beriberi.]—*Bull. Soc. Méd.-Chirurg. Indochine*. 1933. Oct. Vol. 11. No. 7. pp. 863-875. With 2 figs.

A description is given of certain muscular changes found in cases of beriberi.

This change is localized, entirely or in part, to the "jumeaux internes" muscles (gastrocnemii) and is characterized by the volume of these muscles being maintained in contrast with the wasting of surrounding muscles. On palpation a peculiar hardness, like that of hard indiarubber, is felt and on pinching or percussion there is a diminution of contractility. The lesion is usually symmetrical and seems to appear about one month after the onset of neuritis. It is not accompanied by appreciable modification of the arterial circulation in the limb. In spite of pathological investigations upon pieces of affected muscle removed during life the exact nature of the lesion remains obscure. Apparently atrophy of muscular fibres, fatty degeneration and round-celled infiltration constitute the chief findings. *A. D. B.*

URMY (Thomas V.), RAGLE (B. Harrison), ALLEN (Arthur W.) & JONES (Chester M.) **Beriberi Secondary to Short-circuited Small Intestine.**—*New England Jl of Med.* 1934. Feb. 1. Vol. 210. No. 5. pp 251-254 [12 refs.]

A description is given of a case of beriberi following a short-circuit operation on the small intestine. The condition was probably due to defective vitamin absorption and was cured by disconnecting the intestinal anastomosis.

The association of beriberi with gastro-intestinal lesions is much less common than it is in pellagra. The present case is that of a native lawyer, aged 47, who developed intestinal obstruction following appendectomy. A lateral anastomosis between loops of small intestine was performed and diarrhoea, followed later by vomiting, began. Typical beriberi symptoms appeared during the following 2-3 years (peripheral neuritis, oedema, aphonia and cardiac symptoms which did not respond to digitalis therapy). After two blood transfusions the patient was given brewers' yeast and later, liver extract, cod liver oil, insulin, etc., were added. His condition soon improved considerably. Later, again at operation, a hugely dilated jejunum was found and the entero-enterostomy was disconnected. Following this he steadily improved and 2½ years after the last operation he had completely recovered except for slight weakness of the voice and some uncertainty in walking. It may be mentioned that renal calculi developed during the time that the small intestine was short circuited, possibly owing to defective absorption of vitamin A.

Two other cases, similar to the above, are mentioned. In one beriberi developed in a patient with ulcerative colitis and ileostomy; and in the other neurological symptoms of beriberi appeared 2½ years after an enterostomy between the stomach and lower ileum. Both these cases were greatly improved by suitable therapy. *A. D. B.*

MASSIAS (Charles). **Le traitement du bérubéri par une préparation contenant vitamine B et acides aminés (vitaminol).** [**Treatment of Beriberi by Vitamin B or Amino Acids.**]—*Bull. Soc. Méd.-Chirurg. Indochine.* 1933. June. Vol. 11. No. 4. pp. 386-391. [14 refs.]

Since 1930 the author has treated beriberi cases in Cochin China with tablets containing vitamin B and various amino acids. The results have been very satisfactory.

Each tablet contains 12 rat units of vitamin B combined with the following amino acids:—leucine, cystine, lysine, histidine, arginine and polypeptides. The dose is 4 tablets a day taken with meals of rice, "potage de riz," fish and Nuoc-mam. Since 1933 the same mixture has been given in the form of a paste flavoured to suit the native taste. This preparation contains also tryptophane and a substance in the casein amino acid group which has marked growth-stimulating properties. The dose of this paste is one "culler à soupe" a day (the dose may be doubled or trebled) dissolved in water or mixed with rice, fish and vegetables. The treatment has the great advantage of cheapness. The results obtained are as follows:—in 1930, before the treatment was begun, out of 275 beriberi cases 25 died (9.09 per cent.). In 1931, after treatment, out of 322 cases there were 23 deaths (7.14 per cent.), and in 1932 out of 274 cases there were only 8 deaths (2.99 per cent.). Moreover, the fatal cases were moribund on arrival at hospital.

A. D. B.

CHOPRA (R. N.) & BOSE (S. C.) **Cardiovascular and Other Manifestations of Epidemic Dropsy.**—*Indian Med Gaz.* 1933. Nov. Vol. 68. No. 11. pp. 605–617.

This paper gives a very detailed account of the cardiovascular manifestations met with in epidemic dropsy. The disease in nearly every case is associated with the ingestion of contaminated rice grain. A bacillus, similar to that described by BERNARD, was commonly found in the grain and was recovered from the urine and stools in many cases. Toxins elaborated by this organism resemble histamine in having a marked effect upon the capillaries. For cardiac failure in this condition digitalis is useless but tincture of ephedra gives good results.

Cardiac involvement is the rule in epidemic dropsy but its severity varies. It is often more marked in patients with constipation, and when diarrhoea is prominent cardio-vascular symptoms are often slight. Dyspnoea is an early feature and oedema occurs more or less in all cases. The initial oedema is of the solid type and the skin is dusky-red, hot and tender but as cardiac failure sets in the dropsy presents the usual features of that state. Anaemia is a prominent feature. The systolic blood pressure is low (rarely above 110 mm) while the diastolic reading is 50 mm, or less.

In epidemic dropsy the myocardium shows neither inflammation, degeneration nor hypertrophy. The only constant change is capillary dilatation. Cardiac failure, when it occurs, is of the congestive type. Three forms are recognizable:—(1) *Acute*.—Cardiac failure is present at the beginning and rapidly progresses so that death may occur in 4–7 days. The clinical picture is that of an acute left heart failure. (2) *Subacute or chronic*.—These cases present combined right and left heart failure with slight cyanosis, jugular distension and general venous congestion. Recovery is the rule. (3) *Formes Frustes*.—In these the heart escapes or is only very slightly affected.

Clinically the heart is enlarged and though bruits are heard the valves are normal. Tachycardia is constant (110–130) and out of proportion to the pyrexia. The pulse is sometimes of the Corrigan type. On venesection the blood is of a peculiar dark chocolate colour and clots almost at once, the serum being bile-tinted. Fever is an initial and fairly constant symptom and its degree is a rough measure

of the severity of the attack. The authors state that there is undoubted evidence of peripheral neuritis in epidemic dropsy.

Treatment consists firstly in removing rice entirely from the diet. Progress is much slower if this is not done and relapses occur when the patient disobeys orders and resumes his rice diet. For severe diarrhoea liq ferri perchloridi (15-30 minims) is helpful. Digitalis and the other members of the group were found to be useless in cardiac failure. Having regard to the capillary dilatation any drug which will constrict these vessels and restore their tone should prove beneficial. Therefore adrenaline (daily intramuscular injections of 2-4 minims) was tried and relief followed. Unfortunately, however, after a few days sensitiveness to the drug developed and it had to be discontinued. Good results were obtained with tincture of ephedra (20-30 minims, 2 or 3 times a day with or without iron and strychnine). When diarrhoea is present the drain of fluid from the body may be to some extent relieved by combining calcium lactate (10 grains 2-3 times a day) with the above treatment
A. D. B.

- DE ARAUJO (Eduardo). Sobre a etiologia e diagnostico do beri-beri.—*Arch Brasileiros de Med.* 1933 Dec Vol 23 No 12. pp 382-409.
- AUSTREGESILLO (A). Neuro-mieloses beribericas.—*Arch Brasileiros de Med.* 1933 Dec Vol 23 No. 12 pp 357-368 [25 refs.]
- FILHO (Miguel Couto). Beriberi de causa infecciosa.—*Brasil-Medico.* 1933. Dec 9 Vol 47 No 49 pp 869-870
- GAUDUCHEAU (A). Le riz dans l'hygiène alimentaire de l'Extrême-Orient.—*Bull Soc. Path. Exot.* 1933 May 10 Vol 26. No 5. pp 677-687 [Refs in footnotes]
- DE MENDONÇA (João I). Beri-beri (lesões da valvula tricuspidé).—*Arch. Brasileiros de Med.* 1933 Dec Vol 23 No. 12. pp 348-356.
- TAVARES (Armando Sampaio). O systema vegetativo no beriberi.—*Arch Brasileiros de Med.* 1933. Dec Vol 23. No. 12. pp. 369-381. [29 refs.]
- TOULLEC & GOIRAN. A propos d'un cas de bérubéri cardiaque d'emblee chez un Européen.—*Bull Soc Med-Chirurg. Indochine.* 1933. Nov.-Dec. Vol 11. No 8 pp. 977-982
- VILLELA (Gilberto V.). Protéines du plasma, calcium et cholestérol dans le bérubéri.—*C R Soc. Biol.* 1933. Vol. 113. No 27. pp. 1277-1279.
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PELLAGRA.

AYKROYD (W. R.) **Pellagra.**—*Nutrition Abstracts & Reviews* 1933. Oct. Vol. 3. No 2. pp. 337-344. [30 refs.]

A review of the subject containing some interesting public health statistics

Much of the review is founded upon papers summarized from time to time in this *Bulletin*. The section dealing with pellagra as a Public Health problem contains some interesting statistics. In the U.S.A. the total number of deaths from pellagra in 1924 was 2,006 (2.5 per 100,000). The figure then steadily increased so that in 1928 the death rate per 100,000 was 6.4. In the following two years there was a slight decrease. In Italy a very different state of affairs is recorded. In the period 1896-1900 the death rate per 100,000 was 10.7. Since then the rate has steadily declined, until in 1928 it was only 0.2 (total deaths 85 as compared with 3,426 in 1896-1900). A law passed in 1902 prohibited the sale of spoiled maize and compelled the provision of public maize desiccators. Rural bakeries were set up for the supply of cheap wheat bread and charitable kitchens were established which provided soup, and sometimes bread and meat, free or at very low prices. Furthermore, special pellagra hospitals were founded together with asylums for the care of the children of pellagrins. "It is impossible to say how far the diminution of pellagra in Italy can be ascribed to legislative measures, and how far to changes in the diet of the people brought about by rising standards of living and other causes."

In Rumania, according to figures supplied by the Ministry of Health of Bucharest, the total number of pellagra cases in 1930 was 48,542 with 1,717 deaths (death rate of 9.5 per 100,000). In 1932 there were 55,013 cases with 1,656 deaths (death rate 9.0). It is pointed out that these Rumanian statistics are considerably understated. In the U.S.A. it has been found that the increase in the pellagra mortality rate is smaller than the increase in morbidity. This suggests that the curative effect of certain foods enables more sufferers to survive

A. D. Bigland

STANNUS (Hugh S.) & GIBSON (Charles R.). **Pellagra in Great Britain.**—Reprinted from *Quarterly Jl. Med.* 1934 Apr. N.S. Vol. 3. No 10. pp. 211-236. With 1 plate. [39 refs.]

This paper describes in detail a case of pellagra in a child observed in Britain. The account is perhaps unique in presenting a full history of the onset, course, recovery and subsequent progress. There is also a summary of all the pellagra cases published in this country.

Pellagra is a rare disease in Great Britain. The first death from this cause was officially recorded in 1912, though the first clinical description dates from 1866, or possibly 1865. The patient here described is a female, an only child of respectable working class parents living in Weymouth. In April 1927 (at the age of 3 years 8 months) the first symptom was noted, viz., severe "sunburn" involving the neck, hands and the exposed parts of the legs. In August of that year the child became "nervous" and suffered from diarrhoea with abdominal pain. By September the dermatitis had disappeared. Beginning at Easter 1928 an attack similar to the above was recorded with complete recovery in the following winter except for a roughness of the skin of

the hands. During the following years the same sequence of events took place with diarrhoea, change of character, vertigo and unsteady gait. In May 1931 (when the child was nearly 7 years old) a tentative diagnosis of pellagra was made and this was confirmed in June of that year.

"The average daily diet during the years 1928-1930 was as follows: early morning, a cup of tea and a biscuit, breakfast, a rasher of bacon and a tomato or a boiled egg, a glass of water, mid-morning at school, a slice of bread and butter, a glass of milk; mid-day dinner, two potatoes, peas, gravy, sometimes fish like mackerel, or chicken (she did not care much for fish and seldom would eat meat), a little milk pudding or stewed fruit, before tea, a slice of bread and butter, at tea-time an egg (she was very fond of eggs), two pieces of bread and butter with jam, sometimes tinned salmon, a glass of water or a cup of tea (she liked tin salmon and bread and butter); supper, a bowl of bread and milk or sometimes boiled onions and bread and butter, occasionally fish and chips. She had always had a certain amount of fruit—apples, bananas, and strawberries, but disliked oranges and other fruit. During 1931 the child was very difficult to feed and took little except three eggs a day, some milk, and bread and butter. The child had had pop-corn occasionally when quite young."

When seen at the French Hospital, London, the child presented the following appearances: a typical dermatitis (a good photograph confirms this), gastro-intestinal disturbances, signs of nervous system involvement and irregular pyrexia. At the angles of the mouth and at the external canthus of each eye the muco-cutaneous junctions showed a heaped-up sodden white condition of the epithelium and on unexposed areas of skin there was a definite roughness (gooseskin). The tongue was not affected. Various laboratory investigations were carried out but no definite abnormality was found. Shortly after admission to hospital the child became very ill and her condition was one of a semi-typhoid state. The stool at this time showed the presence of a small amount of porphyrin (probably of vegetable origin) but the blood and urine were negative for haematoporphyrin. The skin showed no photo-sensitivity. Rapid improvement followed the taking of one tablespoonful of dry fresh brewers' yeast twice daily (liver extract was tried but discontinued after a few days). On July 17th, 1931 the child was allowed to return home. The mother was instructed about the importance of a well-balanced diet and the yeast treatment was continued. In the summer following discharge from hospital there was a very slight relapse but when seen again in June 1933 the child was in excellent health and only exhibited some goose-skin roughness and very slight unsteadiness when turning round quickly.

The second part of the paper presents a detailed analysis of all pellagra cases published in this country (some 78 cases). It will be noticed that there is a greater incidence of pellagra in the female sex and that it has an association with mental disease. The Registrar-General's reports show that the total number of deaths due to pellagra during 1912-1931 was 131 (20 males and 111 females). A. D. B.

EGYPT. MINISTRY OF THE INTERIOR. DEPARTMENT OF PUBLIC HEALTH. LUNACY DIVISION REPORT FOR THE YEAR 1932 INCLUDING THE MENTAL HOSPITALS OF ABBASSIYA AND KHANKA, AND KHANKA CRIMINAL ASYLUM.—[Pellagra p. 3]

"Pellagra is well known to be a very common disease in Egypt and several hundreds are admitted annually into the Mental Hospitals. Our experience extends over thirty years and it is impossible not to

have formed in that time various definite opinions about this disease. One, undoubtedly, is that the majority of pellagrins apparently recover under treatment but are liable to show definite pellagrous symptoms whenever their health runs down from some intercurrent disease and this is especially marked during a fatal illness and in spite of the fact that the diet in the Hospitals is a sufficiency diet; also cases which undoubtedly never had pellagra do not show these symptoms under similar conditions. The opinion of the medical staff in the Mental Hospitals is that pellagra can usually be kept in abeyance by a sufficiency of food and treatment for symptoms but it is extremely doubtful whether it can ever be eradicated and it is liable to flare up at the above stated period.

"The pellagrin patients come invariably from districts where maize is a staple form of food for at least several months in the year. They do not come from the towns nor from Middle and Upper Egypt where millet replaces maize but they are present in Upper Egypt in districts where maize is largely cultivated such as Komombo. The diet in Upper Egypt is probably poorer than in Lower Egypt and the sun is so much stronger that one would expect more cases from Upper than from Lower Egypt if pellagra was a pure deficiency diet disease and the sun a powerful factor. Also the nervous system is so definitely deranged in pellagra as exemplified by the alteration of the reflexes even such gross examples as ankle clonus being common; the reflexes do not become normal under treatment although all other symptoms may be eradicated. In fact it is impossible to conform our ideas, in the light of our experiences, to the theory that pellagra is a pure diet deficiency disease, and we are strongly of the opinion that there is something more and that it is connected with maize, though a deficiency diet allows the disease to demonstrate its manifestations.

"Most of the pellagrins are admitted in March, April and May when the weather is comparatively cool." A. G. B.

WYJASNOWSKY (A. J.). Zur Frage der Pellagra. [What is Pellagra?]*—Arch. f. Schiffs. u. Trop.-Hyg.* 1934 Jan. Vol. 38. No. 1. pp. 31-37.

Is pellagra a disease *sui generis* or is it a symptom-complex?

Observation on more than twenty cases of pellagra were made at the psychiatric hospital in Tashkent. More than half of the patients died and most of those that were discharged had an obviously bad prognosis. Three had intestinal infestations; one with *Lambliia*, another with *Trichomonas intestinalis*, and a third with *Entamoeba histolytica*. In another group of cases it was found that out of 14 autopsies on pellagra cases 3 men and 1 woman had carcinoma of the alimentary tract. From these observations the author concludes that pellagra is a symptom-complex.

[The association between pellagra and carcinoma of the alimentary tract seems to be generally admitted but the presence of intestinal parasites may be only a coincidence.] A. D. B.

STANNUS (Hugh S.). A Nutritional Disease of Childhood associated with a Maize Diet—and Pellagra.—*Arch. Dis. in Childhood.* 1934. Apr. Vol. 9. No. 50. pp. 115-118.

In a recent issue of the *Archives of Disease in Childhood* Dr. WILLIAMS described a syndrome occurring in native children in the Gold Coast

Colony [*ante*, p. 344]. The children's diet was faulty and contained excess of white maize. The author of the present paper gives reasons for his opinion that the syndrome is in reality pellagra.

The age of the children was 1-4 years. The onset of the condition was associated with irritability, loss of normal colour and glossiness of the skin and hair, attacks of diarrhoea and slight oedema of the hands, feet and face. Suddenly, after 7-10 days black patches appear on the extensor surfaces of the ankles, knees, wrists and elbows. This skin condition spreads and covers the legs and forearms with a "crazy pavement of thickened epidermis." Exfoliation takes place leaving pink areas underneath and small patches of desquamation are also seen on the face, back and elsewhere. Sores on the mucous membranes of the mouth are described. As the disease progresses diarrhoea becomes constant and death ensues, in untreated cases, in a month or less.

The author argues that the skin manifestations described are exactly those met with in pellagra as seen in dark-skinned races. It is pointed out that the distribution of pellagra dermatitis is variable and though it is usually found on exposed areas any form of physical irritation may act as an exciting factor and thus cause the rash to appear on unusual sites. Small sodden areas of white skin round the mouth, external canthus of the eye, prepuce, vulva and anus are also typical. For treatment it is suggested that yeast should be tried and that a search should be made for some naturally occurring fermentable juice similar to the "toddy" found so efficacious by BRAY in the treatment of infantile beriberi in the Central Pacific Island of Nauru

A. D. B.

CUMMINS (Robert C.). **Observations on Pellagra—with Report of a Case.**—*Irish Jl. Med. Sci.* 1934. Mar. 6th Ser No. 99. pp. 113-120. With 2 figs. on 1 plate.

A case of pellagra in the neighbourhood of Cork is here reported.

The patient, a man aged 42, had attacks of summer gastro-enteritis for some years. These became more severe and latterly were accompanied by darkening of the skin and sores round the mouth. Photographs show the presence of a fairly typical pellagrous dermatitis and the clinical appearances, including mental changes, were more or less characteristic. The man's diet had consisted of bread, butter, eggs, meat, potatoes and cabbage. He was not, however, fond of meat but took much porridge made from maize meal. A visit to the man's home, a small farmhouse in the country, revealed the fact that the other members of the family were healthy. They disliked the maize meal and the children refused to eat it. Apparently a vitamin B₂ deficiency, probably periodic, together with the consumption of maize was the cause of the disease. The patient's physical condition improved somewhat on a diet rich in animal protein with the addition of yeast.

A. D. B.

SPIES (Tom D.). **Skin Lesions of Pellagra: an Experimental Study.**—*Arch. Intern. Med.* 1933. Dec. Vol. 52. No. 6. pp. 945-947.

Evidence is presented showing that pellagra dermatitis often improves while the patient is restricted to a diet of corn-starch and lactose.

The author summarizes his work as follows:—“(1) It has been shown in this experiment that persons with pellagra tolerating a diet of

lactose and corn-starch show improvement of their cutaneous lesions. This work confirms and somewhat extends my previous observation that the dermatitis of pellagra improves while the patients receive a so-called 'pellagra-producing' diet. (2) It is recommended that improvement in dermatitis be interpreted with great care before accepting it either as an index of efficacious treatment or of favorable prognosis. (3) It appears possible that the specific chemical substance related to the development of the dermatitis is not the same as that affecting manifestations of the disease in the gastro-intestinal or central nervous system." A. D. B.

MONAUNI (Josef) Ueber Pellagra in der Steiermark. [**Pellagra in Styria.**]*—Wien Klin Woch.* 1933 Nov. 27. Vol 46. No 47. pp. 1413-1418 [61 refs.]

A detailed description of two fatal pellagra cases which occurred sporadically in Styria.

The first case was a male in a good social position. Alcohol was the probable cause. The second case was that of a male labourer. The history extended over 4 years and he had lived upon a maize diet. There was a possibility that here, too, alcohol played a part, though some constitutional defect may have been present as a brother in America also suffered from pellagra.

Two further cases of pellagra associated with carcinoma of the stomach are described A. D. B.

HOFMAN-BANG (A.). Syv tilfaelde af secundaer pellagra. [**Seven Cases of Secondary Pellagra.**]*—Hospitallstidende.* 1933. Nov 2 Vol. 76 No. 44 pp. 1088-1095 With 5 figs.

Only 12 cases of secondary pellagra have hitherto been recorded in Denmark. But as it has been suggested that other cases are to be found merely for the looking, particularly in institutions for the insane, Hofman-Bang has scrutinized not only the present inmates of the asylum to which he is attached, but also the records of patients discharged since this asylum was opened in 1915. The result of these investigations is a crop of new cases, all of which conform to the now fairly well defined clinical picture of secondary pellagra.

In every case the skin changes were characteristic. Another feature common to all was some form or other of chronic, gastro-intestinal disturbance which had presumably interfered with the absorption, in adequate quantities, of the vitamin associated with this disease. In some cases the administration of spinatin was followed by the disappearance of the skin lesions, but it had little or no effect on the patients' mental condition. Indeed, in no case did there seem to be any direct causal relationship between the various psychoses on the one hand and the secondary pellagra on the other. C. Lullingston.

JENSEN (Ellen Vibeke). Tre tilfaelde af secundaer pellagra. [**Three Cases of Secondary Pellagra.**]*—Hospitallstidende* 1934. Mar. 13. Vol. 77. No. 11. pp. 319-322.

Since Hess THAYSEN in the spring of 1933 drew attention to the existence of secondary pellagra in Denmark, search has been made for this disease in many quarters, and a score of cases have been found and published. Ellen Vibeke Jensen adds three more to this number, her patients, as in the case of her predecessors, being asylum inmates.

After giving details of each case, she notes that a scrutiny of the records of the past 10 years of patients in her asylum who died there or were discharged has failed to reveal any case which could definitely be labelled pellagra; for though there were some cases of protracted diarrhoea refractory to treatment, there was no record of the characteristic skin lesions. All her three patients were physically very debilitated when the signs of pellagra appeared, and the mental disease from which they suffered was severe and had lasted a long time. In two the gastro-intestinal disease took the form of obstinate diarrhoea, and in the third case incessant vomiting was accompanied from time to time by diarrhoea. In all three cases, these gastro-intestinal phenomena preceded the appearance of pellagra. Two of the patients had been artificially fed, their food consisting of fresh milk, albumin-maltose, sugar, eggs, and the juice of a lemon or tomato. This dietary should have supplied the necessary vitamins, and the outbreak of the pellagra may have been determined by the anorexia and inadequate feeding which preceded the artificial feeding. The author also discusses the theory that a severe psychosis may affect the functions of the body in such a way that the digestive system is upset and rendered incapable of adequate vitamin absorption. In this connexion it may be noted that severe psychoses are not infrequently associated with protracted diarrhoea which is refractory to treatment and which seems to have neither a bacterial nor dietetic origin.

C Lillingston.

BIGGAM (A. G.) & GHALIOUNGUI (Paul). **Pellagra : its Clinical Features and Pathology with Observations on the Treatment of its Nervous Manifestations by Massive Doses of Iron.**—*Lancet*. 1933. Nov 25. pp. 1198–1203. [13 refs.]

Massive doses of iron give satisfactory results in the treatment of the nervous manifestations of pellagra.

Twenty-six typical cases of pellagra in Egypt were studied. Parasitic infestation of the bowel was found in 94 per cent., a high figure when compared with the general infestation rate of the Egyptian rural population. This may account for the fact that only one member of a family suffers from pellagra though all the members live under the same conditions. Achlorhydria was present in about half of the cases and none of these showed any secretion of acid after histamine injection. There was apparently no relationship between the condition of the gastric juice and the degree of nervous involvement.

Six cases showing neurological changes were treated with massive doses of iron after the method employed by SARGANT in subacute combined degeneration of the cord. Bland's pills, in doses of 150 grains daily, were administered for a period of 6–8 weeks. The results were satisfactory, though one patient died a few weeks later from bacillary dysentery. The authors conclude that the administration of iron together with a well-balanced diet is of extreme importance in the treatment of pellagra cases showing involvement of the nervous system.

A. D. B.

LANE (Clayton); STANNUS (Hugh S.). **Helminths and Pellagra.** [Correspondence.]—*Lancet*. 1933 Dec. 9 & 16. pp. 1345; 1395.

In reference to the paper by BIGGAM and GHALIOUNGUI Colonel Clayton LANE draws attention to a letter by H. M. WOODCOCK (1920)

[this *Bulletin*, Vol 17, p. 148] in which he suggested that in addition to deficient nutrition the presence of a helminthic infection might be necessary for the production of pellagra. Dr. Stannus suggests that the helminth infection plays its part by causing the deficient nutrition

A. G. B.

RUFFIN (Julian M.) & SMITH (David T.). The Treatment of Pellagra with Certain Preparations of Liver.—*Amer Jl Med. Sci* 1934 Apr Vol. 187. No 4. pp. 512-521 With 3 figs & 2 charts.

Liver extracts, when administered orally, give satisfactory results in the treatment of active pellagra. Little or no improvement follows intramuscular injections

A standard basic diet, containing adequate amounts of proteins, fats, carbohydrates, mineral salts and all known vitamins except vitamin G, was prepared. Pellagra cases showed no improvement on this diet and 3 out of 4 dogs partaking of it died of black tongue in 25-45 days. Ten active pellagrins subsisting on this basic diet were given 90 cc of an aqueous liver extract daily by the oral route and all showed a satisfactory remission of symptoms. Five cases similarly fed were given intramuscular injections (5 cc. daily) of Liver Extract no. 343. None of these showed any remission, but when the oral administration of the aqueous extract was substituted a dramatic improvement began within 3-5 days and continued until the patients were apparently well.

The effect of sunlight upon the skin was also studied. It was found that "exposure to direct sunlight in North Carolina in the spring and summer months produces dermatitis in active and potentially active pellagrins, but not in normal controls or in pellagrins who have received adequate treatment"

A. D. B.

SPIES (Tom D.). Treatment of Pellagra by Means of Parenteral Liver Extract.—*Proc. Soc. Experim. Biol. & Med.* 1933. Dec. Vol 31. No. 3. pp. 363-364.

After references to the work of BOGGS and PADGETT and of RAMSDELL and MAGNESS [this *Bulletin*, Vol. 30, pp. 146 and 549] on the administration of liver extract in pellagra the author briefly describes a trial of intravenous and intramuscular liver extract in pellagrins with such severe oral lesions that they refused to eat.

Six patients in whom stomatitis and glossitis were severe received the liver extract intravenously and four others intramuscularly. Within 24 hours the lesions were improved and 72 hours after either form of injection they were healed.

A. G. B.

SMITH (James H.). The Treatment of Pellagra.—*Southern Med. Jl.* 1934. Feb. Vol. 27. No. 2. pp. 163-165.

As a result of its use in a case of pellagra with extensive ulceration in the mouth the author suggests that intravenous injections of sodium thiosulphate are of value in this disease. He refers to the reduction of cystine in the finger-nails of pellagrins with widespread dermatitis, demonstrated by PAYNE and PERLZWEIG [see below] as a reason for believing that errors of sulphur metabolism are important in pellagra.

A. G. B.

PAYNE (Sheldon A) & PERLZWEIG (William A). **Cystine Content of Finger Nails in Pellagra.**—*Jl. Clin Investigation* 1933. Sept. Vol. 12. No. 5. pp 899-908. With 1 fig. [27 refs.]

The cystine content of the finger nails, and presumably of the skin also, in cases with extensive pellagrous dermatitis is markedly decreased. This reduction is not found in pellagrins without dermatitis.

Reference to the literature shows that sulphur metabolism in pellagra is disturbed. An increased excretion of urinary ethereal sulphates and a reduction of sulphur in the central nervous system of pellagrins have been recorded. Also the amount of cystine in the hair of rats decreases when the animals are fed upon a diet deficient in vitamin G. The high concentration of cystine in the epidermal tissues of the higher animals suggests a possible protective function, and it was hoped that experimental evidence could be obtained indicating that the skin lesions of pellagra are photogenic. It was found that finger nails gave more uniform data from which to judge the cystine content of epithelial tissue. Observations were made upon 36 normal subjects, 40 pellagrins and upon 25 cases of syphilis and tuberculosis. "In 14 cases of pellagra with extensive dermatitis there was a marked reduction in the cystine content without any appreciable change in the total protein content of the finger-nails. With the subsidence of skin symptoms and improvement in the clinical condition, the cystine content returned to normal limits. In severe pellagrins without dermatitis (involvement chiefly of the gastro-intestinal or central nervous systems) and in partially or completely cured cases of pellagra there were no marked changes in the cystine content of the finger-nails. In the syphilitic and tuberculous group no definite changes were found whatever the nutritional state of the patient. The good effects claimed for the thiosulphate treatment of pellagra may perhaps be partly explained by the altered sulphur metabolism in this disease.

A. D. B.

ROSCOE (Margaret Honora). **Note on the Incidence of Dermatitis among Rats deprived of Vitamin B₂.**—*Biochem. Jl.* 1933. Vol. 27. No. 5. pp. 1533-1536. [14 refs.]

— **The Vitamin B₂ Content of Various Materials compared by their Power to promote Growth and to cure Dermatitis Respectively.**—*Ibid.* pp. 1537-1539.

— **The Heat-Stability of Vitamin B₂. III. The Rate of Destruction at Various Reactions of Vitamin B₂ contained in Different Materials.**—*Ibid.* pp. 1540-1544. [14 refs.]

(1) The appearance of dermatitis in rats fed upon vitamin B₂-deficient diets is very irregular. The reason for this irregularity is not known and an attempt to solve the problem is described. (2) An account is given of experiments designed to show whether vitamin B₂ contains two separate factors, one for the promotion of growth and the other for the prevention or cure of dermatitis. (3) The heat-stability of vitamin B₂ is discussed.

Paper 1.

"Dermatitis has occurred in 108 out of the 191 rats fed on vitamin B₂-deficient diets in this laboratory during the past seven years. The average time taken for symptoms to develop was 10 weeks.

Time of year, weight increase and various alterations in the diet were without effect on the occurrence of symptoms."

Paper 2.

"The daily doses of yeast extract, egg-white filtrate or meat needed to cure dermatitis associated in young rats with vitamin B₂-deficiency were shown to be proportional to the daily doses needed to promote a given weight increase. This was also true of the yeast extract after it had been treated in acid or alkaline media. Thus no support was found for the theory postulating the existence of separate dietary factors responsible respectively for preventing and curing dermatitis and for promoting growth."

Paper 3.

"... vitamin B₂ was found to be relatively heat-stable in acid solution and the rate of destruction to be increased rapidly with increasing alkalinity."

A. D. B.

FLINKER (Robert). Pellagra und progressive Bulbarparalyse [**Pellagra and Progressive Bulbar Paralysis.**]*—Schweiz. Med. Woch* 1934 May 5 No 18 pp 394-395. With 2 figs

The author describes a case of pellagra of long standing in which bulbar paralysis developed as a result, the author believes, of the pellagra

A. G. B.

HARRIS (Leslie J.) Deaths from Pellagra [Correspondence]*—Brit Med J* 1933 Dec 9 pp 1096-1097

HOLM (Sigrid). Et tilfælde af sekundaer pellagra *—Hospitalstidende* 1934 Jan 2 Vol 76 No 1 pp 21-24 With 2 figs & 1 chart

YELLOW FEVER.

DUDLEY (Sheldon F) **Yellow Fever as seen by the Medical Officers of the Royal Navy in the Nineteenth Century.**—*Proc Roy Soc. Med* 1933 Feb Vol 26 No 4 pp 443-456 (United Services Sect. pp 7-20).

The author has searched the old Naval Reports for records of yellow fever and has gleaned much that is of interest and value. His practical conclusions are that the incubation period may sometimes exceed a week, the case fatality in groups may vary from nothing to 60 per cent, West African strains are as a rule more fatal to Europeans than American strains.

Contagiousness.—Naval medical officers in the nineteenth century were chiefly non-contagionists. The contagionists pointed to the high mortality among doctors; *e g.* PLAZY says that at San Domingo in 1802, 208 out of 300 doctors died. The author thinks that recent laboratory cases described by LOW and FAIRLEY [*this Bulletin*, Vol. 28, p 290] in which yellow fever was contracted in England without the possibility of mosquito transmission, by persons who handled infected blood, suggest the likelihood of direct transmission to doctors in the old days. As he writes, "if direct transmission was more than an exceptional unnatural event a densely crowded ship was the place to find it."

Aethology.—Exposure at night was thought to be specially dangerous and as much effort was made to prevent men exposing themselves to the night air by sleeping on the upper deck as is now made to encourage them so to do. Sexual and alcoholic excess was also held accountable, this doubtless because in drinking dens and brothels the sailors came in contact with both native reservoir and insect vector. Chill and fatigue were blamed because of the high rate of fever among men employed in boats away from the ship; they would often camp in pestilential creeks or native villages and go down with fever on return to the ship. The danger of the proximity of swamps was recognized but the occurrence of yellow fever in time of drought was a mystery till the discovery that storage of water brought the carrier.

The following extract is of special interest.—

"I have picked out the following story as one which illustrates practically all the peculiar points in the epidemiology of yellow fever at sea. I must first explain that it was, and to a less extent is, the fashion to moor old hulks at Naval Bases to act as depôts, where men await an opportunity to join their ships, or to take passage home, or to proceed to other stations. In 1865 the "Isis" was the dépôt ship at Sierra Leone. This year yellow fever is said to have destroyed 27 per cent of the European colony. The first case of yellow fever in the "Isis" was reported on September 28. Then follows a description of case after case of men passing through the ship and contracting the disease. Among these was the surgeon of the "Rattlesnake" who was attending the sick in the "Isis," her own doctor being dead of the disease. The surgeon of the "Rattlesnake" went back to die in his own ship, and apparently infected her, since yellow fever broke out in epidemic form and continued until the "Rattlesnake" went north on December 24. On December 26 the authorities, realizing that the "Isis" was infected, decided to have her cleaned out, and 112 men from H.M.S. "Bristol" were told off for this duty. This party worked on board the "Isis" for two days from 7 a.m. to 10 p.m. The first case in the "Bristol" appeared on December 31, altogether 39 cases, 25 of which died, were recorded. Everyone of these cases was among the 112 men who had been on board the "Isis"; there was no case of fever of any kind reported among the 400 men in the "Bristol" who had not boarded the "Isis."

" [Surgeon] Ayre [of the "Bristol"] could suggest no source of infection of the "Bristol's" victims, except possibly the rain water tanks of the "Isis," from which some of the "Bristol's" working party had drunk. He little realized that these tanks did contain the solution of his problem. These old dépôt hulks used to be roofed in and the water from the roofs was collected in tanks for washing purposes. The tanks formed ideal aquaria in which a home-grown stock of the *Aedes* could be maintained, however far the ship was moored off the beach "

The story needs no commentary.

Incubation period—The nature of ships allows of a reliable estimate of incubation periods. Many naval records show that the incubation of yellow fever is not infrequently over a week. The "Bristol" victims of the "Isis" went sick over a period between December 31 and January 12, "a range of incubation of from three to fifteen days," and in seven instances the period must have exceeded seven days. This and other instances show that the incubation period of yellow fever does sometimes exceed a week, though the International Sanitary Convention assumes that the incubation never exceeds six days.

Diagnosis.—During the seventies the diagnosis of yellow fever was rarely made in the Navy unless the patient had black vomit and jaundice. In 1866 and 1867 DONNET of the Royal Naval Hospital, Jamaica, showed how yellow fever differed from malaria, that it was not a remittent fever, that one attack caused immunity, relapse never occurred and quinine was useless. He further maintained that the characteristic and essentially pathognomonic symptom was albuminuria. After his time many naval surgeons laid stress on albuminuria and absence of response to quinine in the recognition of the disease.

Morbidity and Fatality.—A table of mortality from disease in the Royal Navy, 1825-45, shows that on the West African station it was 6 times as great as at home and 3 times as great as in the West Indies, the other yellow fever station. The excess of deaths, the author says, was caused almost entirely by yellow fever. The deaths in any year tended to be concentrated in one or two ships; striking instances are given. This is described as an "all or nothing" effect, a ship either had a colossal death rate or escaped lightly. In 1845, of 121 deaths in 28 ships 74 occurred on the *Eclair*. She became infected at Sierra Leone, carried infection to Bona Vista in the Cape Verde Islands, left for Madeira and reached England on September 28 by which date 4 medical officers had succumbed, followed by two at Portsmouth in early October, which illustrates the risk to medical officers and shows that the insect vectors could remain active in that month in the warmth between decks. The *Eclair* had a crew of 120 men of whom 74 died, so that the case fatality could not have been less than 61 per cent. In later years, however, there were ship epidemics, probably yellow fever, accompanied by little or no fatality. A study of these epidemics shows that yellow fever varies greatly in virulence. Table III shows that the fatality was significantly higher in the West African than the West Indies station.

Table III.—Tropical Fever, Case Fatality. "Recorded" Yellow Fever.

<i>Period.</i>	<i>Station.</i>	<i>Cases</i>	<i>Deaths.</i>	<i>Fatality %</i>
1856-70	W. Africa	223	126	56.5±1.9
1856-70	W. Indies	1,548	585	37.8±0.8
1871-88	"	151	56	37.1±2.7
1856-88	S. America	120	34	28.3±2.7

In another table are analysed the tropical fever statistics of the West Indian Squadron in 1861, a bad year, with a case fatality of 45 per cent. Here again the "all or nothing" phenomenon comes out—four ships out of 25 accounted for 129 deaths out of 144 reported. The "recorded" fatality in these 4 ships varied from 24 to 80 per cent., it is believed, however, that these divergencies depended more on the diagnosticians than on the virus, mild cases were recorded by some more than others. For similar reasons the author suggests that the real case fatality approached 20 rather than 45 per cent. CARTER states that the fatality among Europeans in North and Central America in the present century, when diagnosis has been reliable, has rarely exceeded 10 per cent. and in Panama in the worst epidemic that CARTER had experience of it was 16.6 per cent. In West Africa yellow fever has always been more deadly to Europeans than in the New World.

Racial Immunity.—The immunity of the West African native to yellow fever is well known. The Krumen were used as attendants on the sick because they never contracted the fever or, if they did, the attack was mild. This immunity is probably an acquired character.

West African Origin of Yellow Fever.—This subject was discussed at length by CARTER in his monograph, and he concluded that West Africa was the original focus. Dudley corroborates CARTER and brings additional evidence for this origin. He cites Sir FRANCIS DRAKE's expedition in 1585 in which he believes yellow fever was contracted at the Cape Verde Islands, and another in 1553; here 100 of 140 sailors died of an epidemic in their ship off the mouth of the Benin river and in a little over a month. Dudley argues that this cannot have been anything else but yellow fever, and points out that the locale is near the recently discovered focus in Ibadan, perhaps "the one place in the world where yellow fever can now maintain a permanent endemicity." No epidemics of this kind were reported at that period from the New World. A. G. B.

KERR (J. A.) & PATIÑO CAMARGO (Luis). Investigaciones sobre fiebre amarilla en Muzo y en la "región de Santander." [*Yellow Fever in Muzo and the Santander Region.*]—Reprinted from *Rev. de Higiene*. Bogota. 1933. Vol. 2 No. 3. 32 pp. With 2 maps & 1 fig. [10 refs.]

The Department of Santander (Colombia) has been invaded by yellow fever on three occasions: Bucaramanga and its environs in 1910-12 and in 1923, Socorro and the vicinity in 1929. By the "Santander Region" is meant the central hilly district of the Department, some 1,000 to 1,300 metres above sea-level.

The authors visited the district, searched for *Aedes*, and took samples of blood (25 cc.) from over 1,000 persons, especially of school children who had been born and brought up in the place. The sera were sent to the Yellow Fever Laboratory of the Rockefeller Foundation in New York for the protection test to be carried out.

As a result of their investigations they have come to the conclusions that yellow fever has been for many years endemic in the rural parts of the Muzo municipality; also that in spite of *Aedes aegypti* being very abundant, yellow fever has not been present among those living along

the banks of the Magdalena River during the past 15 years, nor in the Cúcuta valleys in the past 20 years. In other words during this period there has grown up a large non-immune population. They do not believe that yellow fever has been re-introduced into the region during the past 15 years but that it has remained endemic there, not in the townships but in the rural areas, and this district should consequently be regarded as a dangerous focus whence infection may be propagated to the lower-lying and more readily infectable parts of the country.

H. H. S

DUFF (D.). **A Note on Yellow Fever Control in the Gold Coast and the Present Situation.**—*Gold Coast Rep. on Med. Dept. for Year 1932-33.* Appendix 6. pp 88-93.

A general account of the author's experience of yellow fever control on the Gold Coast. The routine measures in constant use are:—

- " (a) Mosquito destruction in the ports and all the larger towns, and beyond these areas where we can place reliable sanitary staff.
- " (b) Segregation of susceptibles (Europeans) in residential areas with a building-free zone of at least 440 yards from the native town and the enforcement of very special rules for these areas
- " (c) A constant watch by all medical officers for cases of the disease, mild or otherwise, and the collection and dissemination to all stations of information concerning such cases
- " Emergency measures during an outbreak —
 - " (a) Intensification—especially at a focus of outbreak—of the routine anti-mosquito campaign. It is assumed, as a working rule, that when a recognisable case occurs, an outbreak is going on somewhere in a mild unrecognisable form, and that a genuinely "sporadic" case cannot really occur
 - " (b) Proclamation by law of 'infected areas' in order to obtain emergency powers for the sanitary authority
 - " (c) Temporary evacuation, if necessary, of susceptibles from such areas
 - " (d) Isolation and careful screening of cases, and fumigation of houses where such cases have occurred "

With regard to their application, the introduction of a piped water supply is the most effective single measure for limiting the breeding of mosquitoes in towns, and where this is impracticable water supplies need constant supervision. The segregation of Europeans outside the native towns has been encouraged by the Government since 1908 and as a result the invaliding and mortality rates have been considerably reduced. The Syrians, however, continue to live in the native towns and are often the first to be attacked in outbreaks of yellow fever.

Every medical officer is encouraged to notify any suspicious case, and if the diagnosis is confirmed other administrations in West Africa are notified by cable.

Anti-mosquito control is based on the monthly larval index, and efforts are directed to keeping it well below 5 per cent. Yellow fever has never broken out in any centre where segregation combined with mosquito control has been practised.

With reference to air transport the author considers that it is possible to control specialized areas. Consequently there should be no difficulty in siting aerodromes so that the chance of any infected mosquitoes getting on board an aeroplane would be almost nil. The chance of a

passenger who may be incubating yellow fever being taken on board might be met by insisting that the passengers and crew should dwell in a controlled area for 6 days before departure *E. Hindle.*

MATHIS (Maurice). Transmission expérimentale de la fièvre jaune par piqûres de stégomyies, à Paris, en janvier, février, mars 1934 [Experimental Transmission of Yellow Fever in Paris by Bites of *Stegomyia* during January, February and March, 1934.]—*C. R. Soc Biol.* 1934. Vol 115 No. 11 pp. 1217-1219.

Two monkeys in Paris were infected with yellow fever by the bites of mosquitoes infected respectively with the Asibi and French strains of the virus. *E. H.*

DAVIS (Nelson C). **Transmission of Yellow Fever Virus by *Culex fatigans* Wiedemann.**—*Ann Ent. Soc Amer.* Columbus, Ohio 1933. Sept. Vol 26 No 3. pp. 491-495.

Using the Asibi strain of yellow fever virus, in two experiments the author succeeded in transmitting the disease to *rhesus* monkeys by the bites of infected *Culex fatigans*.

In one experiment 14 insects were fed on the monkey 17 days after an infective blood meal, and the animal died of typical yellow fever. In another experiment 7 fed after a 20-day interval, and 8 more fed 3 days later on the same monkey, which developed fever, but recovered and was immune. In spite of these positive results this species does not seem to be an efficient host for yellow fever virus, and although in one lot of mosquitoes survival of the virus was demonstrated by injection as late as 39 days after the meal of infected blood, in many experiments there was evidence that the insects were able to free themselves from the virus. *E. H.*

SMITH (E C) **A Case of Sub-Acute Yellow Atrophy Clinically Suggestive of Yellow Fever.**—*West African Med J.* 1933. Oct. Vol. 7. No. 2 pp. 91-93. With 2 figs. on 1 plate.

The record, including pathological details, of a case of acute yellow atrophy (or necrosis) in a West African native, in which the clinical symptoms closely resembled those of yellow fever. Post-mortem examination showed that a severe broncho-pneumonia had supervened, the toxins emanating therefrom causing further damage to an already overburdened and incompetent liver. Haemorrhages and erosions were present in the stomach, presumably as a result of passive congestion.

This condition is very uncommon in the African native and the tendency for it to simulate yellow fever should be borne in mind.

E. H.

HINDLE (Edward). **Recent Laboratory Contributions to the Control of Yellow Fever.**—*Proc. Roy. Soc. Med.* 1933. Dec. Vol. 27. No. 2. pp. 203-210 (Sect. of Trop. Dis. & Parasit. pp. 1-8).

A general account of the subject with special reference to the more important laboratory contributions to the control of yellow fever and

summarized under three headings, (1) Methods of diagnosis, (2) transmission, and (3) protection

In the discussion on the paper Colonel S. P. JAMES agreed that the articles relating to yellow fever in the International Sanitary Convention of 1926, and the International Sanitary Convention for Aerial Navigation of 1933, did not cover all the possible risks indicated by the results of recent laboratory research, but stated that it was the practice to base such regulations on what occurred in the great majority of cases rather than on what might occur very exceptionally. *E. H.*

MATHIS (Maurice). Sensibilité du cobaye au virus de la fièvre jaune. [The Susceptibility of the Guinea-pig to Yellow Fever Virus.]—*C. R. Soc. Biol.* 1934. Vol. 115. No. 8. pp. 842-844.

The Asihi strain of yellow fever virus derived directly from infected *rhesus* has been inoculated intracerebrally into mice and guinea-pigs in order to determine especially whether the latter were readily susceptible to the viscerotropic virus. One of the first two guinea-pigs inoculated developed paralysis and was killed on the 10th day. Two guinea-pigs inoculated from this animal died on the 9th and 10th days, and two used for the third passage died on the 7th day. It is evident, therefore, that the guinea-pig is susceptible to ordinary yellow fever virus and not only to the so-called mouse neurotropic virus. Clinically the infected guinea-pigs were found to show a myelitis, not an encephalitis. *E. H.*

LLOYD (Wray) & MAHAFFY (Alexander F.). The Survival of Neurotropic Yellow Fever Virus in Testicular Tissues.—*Jl. Immunology.* 1933. Dec. Vol. 25. No. 6. pp. 471-482. With 1 fig

Neurotropic yellow fever virus of the French strain after its 212th to 249th passages in mice, was inoculated into the testes of albino mice, and found to survive for periods up to five days.

By making passages every fourth day the virus was transferred through nine passages in the testicular tissues and retained its neurotropic character. Virus isolated from the 6th and 7th passages, respectively, in the testes of mice was found to give the same specific immunological reaction as yellow fever virus in passive immunity tests. Moreover, a *rhesus* monkey inoculated subcutaneously with the testicular virus, showed only a mild febrile reaction 26 days after the inoculation, but was immunized against the disease. *E. H.*

FINDLAY (G. M.). The Infectivity of Neurotropic Yellow Fever Virus for Animals.—*Jl. Path. & Bact.* 1934. Jan. Vol. 38. No. 1. pp. 1-6. With 4 figs. on 1 plate. [13 refs.]

With the object of obtaining larger supplies of neurotropic virus, the author has determined the reaction of a number of animals to intracerebral inoculation with two strains of yellow fever.

The cat, ferret, rabbit, rat, golden hamster (*Cricetus auratus*), wood vole (*Apodemus sylvaticus*), bank vole (*Evotomys glareolus*), pigeon, hen and canary showed no signs of disease. The virus was found to survive for a few days in those animals examined, up to 6 days in the

case of the rat, but there was no evidence of any multiplication, nor any histological changes in the brain. The sera of the cat, ferret, rabbit, rat, pigeon and hen were tested by the mouse protection test before inoculation and three weeks afterwards. All were found to have acquired protective antibodies against yellow fever virus.

Guineapigs, red squirrels (*Sciurus vulgaris*) and field voles (*Microtus agrestis*) developed clinical symptoms of fatal encephalitis, 17 passages being made in guineapigs and 5 in field voles. Histologically the brains of these voles showed meningeal infiltration together with scattered areas of perivascular infiltration and here and there degenerative changes in the ganglion cells, but these changes were never so extensive as in mice. Similar histological changes were also present in the infected squirrels. E. H.

BUDING (E.). Sur la teneur en graisses et en phosphore lipodique du foie chez les cobayes atteints de fièvre jaune et de spirochétose ictérohémorragique. [The Fat and Lipoid Phosphorus in the Liver of Guineapigs infected with Yellow Fever and with Spirochaetal Jaundice.]—C. R. Soc. Biol 1933. Vol. 114. No. 38 pp 1152-1155.

The author has studied the fatty degeneration of the liver in guineapigs infected either with yellow fever or with spirochaetal jaundice. In both diseases it was found that there is an increase in the total lipoids, accompanied by a corresponding diminution in the amount of lipoid phosphorus in the lipoid fraction. These results indicate that the superabundant fat in the liver is not produced by any transformation of the hepatic proteids. E. H.

NICOLAU (S.), KOPCIOWSKA (L.) & MATHIS (M.). Inclusions intranucléaires dans le système nerveux des cobayes et des souris morts de fièvre jaune expérimentale; genèse, morphologie et interprétation. [Intranuclear Inclusions in the Nervous System of Guineapigs and Mice Dead from Experimental Yellow Fever: their Origin, Morphology and Significance.]—C. R. Acad. Sci. 1934. Jan. 15. Vol. 198. No. 3. pp. 288-290.

The authors describe the intranuclear inclusions present in the nerve cells of guineapigs and mice infected with neurotropic yellow fever virus. In mice inclusion bodies were also found exceptionally in the vascular endothelium and the cells of the choroid plexus, which shows that the virus is not strictly neurotropic.

Discussing their appearance the authors consider that previous observers have not clearly demarcated between the formation of inclusions, one of the results of cellular resistance, and the oxyphile degeneration of the nucleus, resulting either from the sickness or death of the cell. E. H.

FINDLAY (G. M.) & BROOM (J. C.). Experiments on the Filtration of Yellow Fever Virus through "Gradocol" Membranes.—Brit Jl. Experim. Path. 1933. Dec. Vol. 14. No. 6. pp. 391-394.

Filtration experiments were made with neurotropic and viscerotropic strains of yellow fever virus. By the use of "Gradocol" membranes

the neurotropic virus was found to have a limiting pore size of 55μ , therefore the diameter of the virus particles is estimated to lie between 18 and 27μ . A few experiments with a viscerotropic virus gave similar results; therefore the particles are probably within the same range of size as those of the neurotropic virus.

Relative concentration of the virus was obtained by passing suspensions through a 50μ membrane E H.

FINDLAY (G. M.). Nouvelles expériences concernant l'immunisation contre la fièvre jaune. [New Experience of Immunization against Yellow Fever.]—*Bull. Office Internat. d'Hyg. Publique*. 1934. Jan. Vol. 26 No. 1. pp. 43–51.

The author gives particulars of 120 patients who have been immunized against yellow fever, including 117 Europeans, 2 Africans and one Hindu. It is of interest that neither of the Africans showed any trace of reaction after the inoculation, whilst the Hindu had a febrile reaction which lasted 48 hours. 40 persons have been immunized by the subcutaneous inoculation of serum and virus, and 80 by intradermal inoculation.

Of the 40 persons vaccinated subcutaneously one was immune before vaccination and showed no reaction; 15 had very slight reactions without fever, and 24 reacted with temperatures above 37.2°C . Only one of these cases showed any serious symptoms.

The technique of the intradermal method was worked out by experiments on monkeys. The region of the skin selected as the site of the injection, preferably the abdomen and showing no superficial vein, is carefully cleaned. Then 1 cc. of immune serum of known titre is drawn up into a sterile tuberculin syringe provided with a fine intradermic needle, similar to those used for the Schick test (about 0.45 mm. in diameter). Four inoculations of 0.25 cc. each are then made in the skin at the four angles of a one-inch square. Two hours later in the same region of the skin, at the middle of the square, an intradermal injection of 0.2 to 0.3 cc. of the virus suspension is administered. The latter is prepared by making a 1 in 10 suspension of infected mouse brain in normal human serum, and then passing it through a Seitz filter.

Out of 80 patients immunized by this method, only 30 have shown any temperature above 37.2°C . and of the 50 showing no fever, 26 had no appreciable reaction. The local reactions were extremely slight, however, and among those showing no fever, the only symptoms consisted of a slight headache, a feeling of lassitude or heaviness, sometimes shivering, often accompanied by a subnormal temperature. As a rule these symptoms appeared about 30 hours after the injection of the virus and lasted for 24 to 48 hours.

The 30 cases showing a temperature of more than 37.2°C . are divided into 3 groups:—(1) 10 cases in which the fever appeared within 48 hours of the injection; (2) 4 cases with a reaction within 48 hours followed by exacerbation later; and (3) 16 cases with a retarded reaction 4 days or more after the inoculation.

The amount of antibodies developed after intradermal inoculation is not below that following the subcutaneous method, and in view of the

much smaller quantities of immune serum required (1 cc instead of 35 to 40 cc) this method possesses very considerable advantages

E H.

FINDLAY (G. Nicoll) **Immunization against Yellow Fever.**—*Trans Roy Soc Trop Med & Hyg* 1934 Mar 12 Vol 27. No 5 pp 437–464 [59 refs.]

This important paper should be read in its entirety by those interested in the subject, for although the main conclusions concerning the efficiency of the intradermal method of inoculating virus and immune serum have been published previously [see above] the present article contains many additional details and also particulars of more cases.

With reference to the neurotropic virus it is of especial interest that in the hedgehog, *Erinaceus europæus*, the intracerebral inoculation of this type of yellow fever virus may produce necrotic changes in the liver. It was found possible to infect mice and monkeys by introducing the neurotropic virus in the nostrils, encephalitis being produced. Up to the end of 1933, the author had immunized 200 persons against yellow fever with varying doses of mouse-fixed neurotropic virus and human immune yellow fever serum, of which 86 or 43 per cent reacted with a temperature above 99°F with varying symptoms, which are described in detail. Virus was detected in the circulating blood in 2 out of 16 cases, and with the object of preventing the occurrence of virus in the blood and also reducing any reaction, some of the persons were inoculated subcutaneously with 5 cc. of immune serum in addition to the ordinary intradermal injections. The specificity of the mouse protection test for immune bodies to yellow fever is again brought out by the author's results, for patients recovered from Rift Valley fever, dengue, and also a form of infective jaundice in Barbados, all failed to give any protection. In addition, of 26 Europeans resident in West Africa, only one gave protection and he had a history of an attack of infective jaundice. 22 residents in Great Britain all failed to show the presence of immune bodies to yellow fever while 9 persons with a history of the disease all gave protection. On the other hand the sera of 115 persons examined after immunization were all positive, the immune bodies appearing after 8 to 9 days, and attaining their maximum titre in from 4 to 5 weeks. After 10 to 11 months the titre decreased, but immune bodies could still be detected up to at least 16 months after inoculation.

Both the neurotropic and viscerotropic strains of yellow fever virus, in the presence of 1 in 100,000 methylene blue, were inactivated by exposure to a pointolite lamp but the antigenic activity was destroyed.

E. H.

SELLARDS (A. W.) & LAIGRET (J.). **Durée de l'immunité consécutive à la vaccination contre la fièvre jaune.** [**The Duration of Immunity following Yellow Fever Vaccination.**]—*C. R. Acad. Sci.* 1934. Mar. 12. Vol. 198. No. 11. pp 1086–1087.

The sera of two patients who were vaccinated by the inoculation of small doses of mouse virus without immune serum, have been tested after intervals of 10 and 25½ months respectively. Both were found to protect mice against at least 640 lethal doses of the virus. E H.

LAIGRET (J.). Le controle des vaccinations antiamariles par l'épreuve de protection sur souris. [**The Control of Yellow Fever Vaccination by Protection Tests in Mice.**]—*Arch. Inst. Pasteur de Tunis.* 1934. Mar Vol 23 No 1. pp 43-47.

The author recommends the intracerebral protection test in mice, described by THEILER, in order to determine the protective power of the serum of vaccinated persons. E. H

SOPER (Fred L.) & SERAFIM (J.), Jr. **Note on the Breeding of *Aedes (Taeniorhynchus) fluviatilis*, Lutz, in Artificial Water-Deposits.**—*Amer. J. Trop. Med.* 1933. Nov. Vol 13 No. 6 pp 589-590. With 1 fig

When mosquito larvae collected in the Valle do Chanaan, Espirito Santo, Brazil, where yellow fever was epidemic (*ante*, p 77) were being classified, larvae of *Aedes fluviatilis* were found among specimens taken from cement ant-rings. Moreover, rock-hole breeding places of this species were found within 30 yards of houses and adults were captured there. Since *A. fluviatilis* has been shown by DAVIS and SHANNON to transmit yellow fever readily in the laboratory these observations have significance. [See this *Bulletin*, Vol 28, p. 727 In 11 trials there were at least 8 infections] A. G. B

KUMM (Henry W.). **Mosquitos breeding in Bromeliads, at Bahia, Brazil.**—*Bull. Entom. Res.* 1933. Dec. Vol. 24. Pt. 4. pp. 561-573. With 12 figs. & 2 coloured plates

PERYASSÚ (1930) has stated that larvae of *Ae. aegypti* are sometimes seen in Bromeliads and that they had been found here 11 times in 1,194 collections. Effort has been made during yellow fever campaigns to destroy these plants; hence this investigation, of which it will be sufficient to give the conclusions:—

"Twenty-one collections of larvae and pupae from Bromeliads, growing in trees or on the ground, were made in São Salvador, the capital of the State of Bahia, Brazil. Four species of *Microculex* and one *Sabethine* were bred out. Of these, one new species and certain new forms are described. The new species is called *Culex (Microculex) davis* in honour of Dr. Nelson C Davis, at whose suggestion this study was first undertaken. Since no *Aedes (Stegomyia) aegypti* were found, it would appear that Bromeliad breeding is probably of no importance from the standpoint of a yellow fever control campaign in this region." A. G. B.

KERR (J. A.) **Studies on the Abundance, Distribution and Feeding Habits of Some West African Mosquitos.**—*Bull. Entom. Res.* 1933. Dec. Vol. 24. Pt. 4. pp. 493-510. [14 refs.]

The work here recorded was carried out during 1930-1931, chiefly in and around Lagos, in order to gain further knowledge of mosquitoes "found experimentally to be vectors of yellow fever."

Lists are given of these species, and of those "non-lethal to the virus . . . but which have not been shown to be capable of transferring it by their bites." The methods employed to obtain the information desired were:—catching mosquitoes inside houses by day; catching at night with human bait during three hours commencing at sunset ("standard night catches"); and catching throughout the night, from sunset to sunrise, by two boys at the same spot, the mosquitoes

caught during each hour being segregated. In view of previous observations by others in the same locality, the author, being specially concerned with species that attack man, paid little attention to the rearing of larvae. Among the results obtained, which are set forth in a series of tables and discussed in the text, a few points may be noted.

In daytime catches inside native houses from 30th April to 24th July, 1930, *Anopheles gambiae* (*A. costalis*), that well-known African malaria-carrier, which does not convey yellow fever, was enormously in the majority—12,098 individuals, out of a total of 14,554 belonging to more than eleven species, by comparison, the number (24) of *Aedes aegypti* taken seems well-nigh negligible; the latter species was also rarely caught by night out-of-doors. *Aedes africanus* and *A. luteocephalus*, common West African tree-hole breeders, and experimental vectors of yellow fever, also seem to be conspicuous by their absence inside houses near Lagos, though aggressive in the open during the first hour and a half after sunset. *Eretmopodites chrysogaster*, another experimental vector, which breeds by choice in small collections of water in fallen leaves among cocoa-plantations, is believed on the evidence obtained not to bite man in nature. *Mansonia africana*, also an experimental vector and a notorious pest which feeds by preference on human blood, not only enters houses in search of food but bites freely out-of-doors the whole night through. *Mansonia uniformis*, though closely resembling *M. africana* both in appearance and habits, belongs to the group of mosquitoes the members of which may retain the yellow fever virus for life, though apparently incapable of acting as vectors.

E. E. Austen

PHILIP (Cornelius B.). Mosquito Species breeding in "Test" Water Containers in West Africa.—*Bull. Entom. Res.* 1933. Dec. Vol. 24 Pt. 4. pp 483-491.

In continuation of similar work by DUNN (this *Bulletin*, Vol. 25, p. 273) during the greater part of the dry and commencement of the wet season, in and about the compound of the West African Yellow Fever Commission near Lagos, the present author on the same spot, using bamboo sections as containers, made continuous observations on mosquito-breeding during the wet season and beginning of the dry. Prior to final acceptance, the contrasting seasonal data thus obtained must obviously be checked by the experience of several years.

The ten containers used by Philip, which were filled with rain-water so long as this was available, were with three exceptions deposited in the same places as those employed by DUNN and were examined at five-day intervals. Fifteen species—all Culicines—availed themselves of the breeding facilities afforded, and, as was also found by the earlier worker, *Aedes aegypti* occurred more frequently than all the others combined; while, as before, its larvae were most numerous in a shaded container 33 yards from an animal house.

E. E. A.

MOURRIJOY (J. E.). An Observation on Mosquito Breeding in Pawpaw Trees.—*East African Med. Jl.* 1933. Oct. Vol. 10. No. 7. pp. 214-216. With 4 figs.

Stimulated thereto by a report that the cutting down of a living papaw [*Carica papaya*] tree had caused the liberation of a quantity of water from within the trunk or one of the branches, the author ordered

a careful examination to be made of the papaw trees in Kigoma, Tanganyika Territory. Out of eighteen of these trees which were found to contain water—in one case between $1\frac{1}{2}$ and 2 gallons—mosquito larvae, both *Culex* and *Aedes* but chiefly the latter, were discovered in fourteen. In an old papaw tree, the disappearance of the transverse septa within the trunk may allow a large volume of water to pass down and accumulate, possibly below the level of the ground; and since the orifice of ingress, usually in a fork or where a branch leaves the trunk, may be too small to admit an exploratory ladle, an important source of mosquito breeding may easily be overlooked. E. E. A

BLISS (A. Richard), Jr. & GILL (Jessie May). **The Effects of Freezing on the Larvae of *Aedes aegypti***—*Amer Jl Trop. Med.* 1933. Nov. Vol. 13 No. 6. pp. 583-588. [11 refs.]

The development and extension of aerial transport has caused increased attention to be paid to the possibility of the conveyance by this means of adult, and possibly infected, *Aedes aegypti*, although rapid carriage would not necessarily assist the insect to establish itself in a temperate climate.

In order to discover whether the larval stage of *A. aegypti* can survive being embedded in ice, "and, if so, for how long," the authors froze two batches of larvae in solid ice for from two to eleven, and ten to sixteen hours respectively. Exposure to this treatment for eleven hours or more proved fatal; but larvae encrusted in ice for not longer than ten hours, and then gradually thawed, revived and produced adults in about the same time as controls. Since the egg-stage of this species is known to be more resistant to freezing, should *A. aegypti* be capable of surviving where its larvae are frozen solid in winter, such survival must depend "upon the eggs, or the hibernating females, or both."

E. E. A.

MONTEIRO (J Lemos) Sobre possíveis vehiculadores do virus amarellico (A proposito de um trabalho de H Kumm e M Frobisher)—*Brasil-Médico* 1933. Apr 15 Vol. 47 No 15 pp 257-258.

MONTEIRO (J Lemos) & TRAVASSOS (J) A reacção de fixação do complemento na determinação de focos e no diagnostico retrospectivo da febre amarella — *Brasil-Médico* 1933 Apr. 29 Vol. 47 No 17. pp 298-302

RUSSELL (Frederick F) Permanent Value of Major Walter Reed's Work on Yellow Fever—*Amer. Jl. Public Health* 1934 Jan Vol 24. No 1. pp. 1-7 [21 refs.]

RELAPSING FEVER AND OTHER SPIROCHAETOSSES.

MATHIS (C) & DURIEUX (C) Fréquence à Dakar de la spirochétose récurrente à tiques [The Frequency of Tick Fever at Dakar.]—*Bull. Acad. Méd.* 1934. Apr. 17. 98th Year 3rd Ser Vol. 111 No. 14. pp 528-532.

Three out of ten natives at Dakar, inoculated with the *crocidurae* strain of *Spirochaeta duttoni*, showed no reaction whatever; six had a single febrile attack without relapses, and only one out of the ten showed a typical attack of relapsing fever. These results support the view that the disease is relatively common, but not often recognized.

The examination of the local fauna showed that many of the rodents can serve as reservoirs of infection, in addition to *Crocidura stampflii*. Out of 18 lots of rats comprising 80 animals, 13 lots were infected as tested by the inoculation of blood or brain emulsion into mice or rats. The results were as follows:—

<i>Epimys decumanus</i>	...	...	( 5 animals); 1 lot, positive
„ <i>alexandrinus</i>	..	...	(10 animals), 3 lots, all positive
„ <i>rattus</i>	...	...	(29 animals); 6 lots, 1 positive
„ <i>golonda campanae</i>	...	...	(15 animals), 3 lots, 3 positive
„ <i>coucha</i>	...	..	(13 animals), 3 lots, 2 positive

The common wild mice *Mus musculus gentilis*, and *Mus musculus spreus*, were only rarely infected, and out of 11 lots, comprising 65 individuals, the spirochaete was only found 4 times in the brain, whilst the examination of the blood in 9 lots of 5 each (45 individuals) was uniformly negative.

Out of 34 *Crocidura stampflii*, divided into 9 lots, inoculation of the blood was positive in 6 cases and of the brain in 4 cases, and it is evident that this animal is the most important active reservoir of the infection since its blood so frequently contains spirochaetes.

The authors also give figures showing the extreme abundance of the transmitting agent, *Ornithodoros erraticus*, in Dakar and its neighbourhood, and from their observations it would seem that relapsing fever must play an important part in the pathology of the district. In nine months from April to December 1933, they were able to diagnose 26 human cases of the disease.

E. Hindle.

MATHIS (C.), DURIEUX (C.) & ADVIER (M.). Transmission naturelle et expérimentale à l'homme du spirochète infectant dans la nature, à Dakar, la tique: *Ornithodoros erraticus* vel *maroccanus*. [Natural and Experimental Transmission to Man of the Spirochaete naturally infecting the Tick, *Ornithodoros erraticus* vel *maroccanus*, at Dakar.]—*Ann. Inst. Pasteur*. 1934. Feb. Vol. 52. No. 2. pp. 166-178. With 4 charts.

Details of the results of feeding *Ornithodoros erraticus* infected with Dakar relapsing fever, on patients undergoing pyrotherapeutic treatment. It is of interest that two of the patients bitten by ticks failed to become infected, as tested both by microscopical examination of the blood and also by subinoculation into white mice. Yet the same batches of ticks subsequently produced infection when fed on other patients.

The author's results confirm those previously described as to the identity of this infection with *S. duttoni*, but in Dakar *O. erraticus* takes the place of *O. moubata* as the transmitting agent. [See this *Bulletin*, Vol. 29, p. 555; Vol. 30, p. 14, and Vol. 31, p. 87.]

E. H.

ANDERSON (Charles) & WASSILIEFF (A.). Sur un nouveau spirochète récurrent du type *Hispanicum* rencontré chez *Ornithodoros erraticus* du Sud-Tunisien. [A New Relapsing Fever Spirochaete of the *Hispanicum* Type found in *Ornithodoros erraticus* from South Tunis.]—*Arch. Inst. Pasteur de Tunis*. 1933. Nov. Vol. 22. No. 3. pp. 350–363. With 6 charts & 1 fig.

Specimens of *Ornithodoros normandi* and *O. erraticus* collected mainly from burrows of *Meriones shawi* in various regions radiating from Ben-Gardan, were tested for their infectivity to guineapigs. *O. erraticus* was found to be infected with a spirochaete which was transmissible to guineapigs both by the bites of these ticks and also by the inoculation of ground-up suspensions of their contents. This spirochaete, although belonging to the general group *hispanica*, was found to differ in its cross-immunity reactions from a strain of *S. hispanica* isolated from a case of relapsing fever in Menzel-Temime, Tunis, and also from strains of *S. duttoni* and *S. normandi*. The lytic power of the serum was also tested, with similar results.

The virus seems to be highly pathogenic to man. The first patient, who received a conjunctival inoculation, became infected after an incubation period of 9 days, and died on the 27th day. The second patient, inoculated subcutaneously, also showed an incubation period of 9 days, then a severe febrile attack of 4 to 5 days, with numerous spirochaetes in the blood, followed by relapses during which spirochaetes reappeared in the blood unaccompanied by febrile symptoms. A specimen of *Meriones shawi* inoculated with this strain showed no visible spirochaetes in its blood, but was infectious to guineapigs. On the other hand, a porcupine inoculated with the same virus showed spirochaetes in its blood after an incubation period of 10 days. There seems little doubt that *Meriones shawi* is the natural reservoir of this strain of relapsing fever.

E. H.

DELANOË (P.). Au sujet de la présence chez l'écureuil de Gétulie d'un spirochète sanguicole, probablement récurrent, différent du spirochète hispano-marocain. [Concerning the Presence of a Blood Spirochaete, probably a Strain of Relapsing Fever, Different from *S. hispanica*, in the Gétulie Squirrel.]—*Bull. Soc. Path. Exot.* 1933. Dec. 13. Vol. 26. No. 10. pp. 1246–1248.

The author has found a blood spirochaete in Gétulie squirrels from Agadir. Guineapigs, as well as *Meriones shawi* and the white rat, were found to be refractory to infection with this strain; therefore it differs from *S. hispanica*.

White mice could be infected with difficulty, but only showed rare spirochaetes in the blood for one day. Grey mice (*Mus musculus* far Cabrera, 1931) were also inoculated and found to be more susceptible to the infection, although even in this species few spirochaetes appeared in the blood.

E. H.

DELANOË (P.). L'écureuil de Gétulie, *Atlantoxerus getulus* L., 1758, est-il un réservoir du spirochète hispano-marocain, *Sp. hispanicum* Nicolle et Anderson 1928? [Is the Gétulie Squirrel, *Atlantoxerus getulus* a Reservoir of *S. hispanica*?]—*Bull. Soc. Path. Exot.* 1933. Dec. 13. Vol. 26. No. 10. pp. 1244–1246.

Six young Gétulie squirrels were inoculated either intraperitoneally or subcutaneously with large doses of two strains of *S. hispanica*.

None of the squirrels showed any signs of infection, and the inoculation of their blood, and in four instances the central nervous system, into guineapigs gave negative results

If, however, the spirochaetes were inoculated intracerebrally into these squirrels, they could persist in the brain for at least three months and probably longer. However, the author points out that as this species is refractory to ordinary subcutaneous inoculation, which would be the method of infection by the bite of an infected arthropod, it is not likely to be a reservoir of this spirochaete.

With regard to the strain of *S. hispanica* found by BLANC and his collaborators [*ante*, p. 87] in lice collected from these squirrels, the author is of the opinion that the lice must have acquired the infection from some other rodent. E. H.

DELANOE (P.). La belette, *Putorius vulgaris* L., réservoir du spirochète hispano-marocain. [The Weasel *Putorius vulgaris* as a Reservoir of the Spanish-Moroccan Spirochaete.]—*Bull. Soc. Path. Exot.* 1933. Dec 13. Vol. 26. No. 10. p. 1249.

A young weasel, caught in Morocco, was found to contain numerous spirochaetes in its blood, which when inoculated into 3 guineapigs produced typical infections of *S. hispanica*.

The weasel showed two attacks when spirochaetes were present, one of 3 days and the other of 5 days duration, with an interval of 2 days. On the 13th day the animal was killed and its blood inoculated into guineapigs with negative results. The central nervous system, however, still contained the virus, for 4 out of 5 guineapigs inoculated with a brain suspension became infected. E. H.

i COLEMAN (George E.). Relapsing Fever in California. I. The Experimental Disease.—*Jl. Infect. Dis.* 1933. Nov-Dec. Vol. 53. No. 3. pp. 337-354. [44 refs.]

ii ——. Relapsing Fever in California. II. Immunity.—*Ibid.* 1934. Jan.-Feb. Vol. 54. No. 1. pp. 1-22. [38 refs.]

i. A detailed account of relapsing fever in California based on the study of three strains isolated from human cases.

Two of the patients were bitten by ticks (species unknown) at Brookway, Lake Tahoe, and in both clinical relapsing fever developed. The blood contained spirochaetes and was infectious by direct transmission to monkeys and rats. The third strain was obtained from the author's own blood and as in the case of the other two was probably a relapse strain. The source of this infection is a little obscure but it probably originated in the laboratory.

A study of the experimental disease in mice showed that all three Californian strains were practically identical though one was more virulent than the other two. Spirochaetes appeared in the blood after 18 hours to 3 days and there were usually two or three relapses, sometimes four and rarely five. The first attack lasted two to five days and the first two relapses from one to ten days. With small doses there were very few deaths, but with larger doses there was a high mortality. A mixture of 0.5 cc. infected blood, collected during the first relapse, and 8 cc. of defibrinated sheep's blood, was found to be infectious after 140 days at 0°C. Symptoms due to lesions of the nervous system were observed in seven mice, but whether the result of the infection or not is a little uncertain. The disease produced in mice by the Californian

strains was found to be more severe than that caused by *S. novyi*, and possibly than that caused by *S. duttoni*. The blood of two adult guineapigs on the 22nd and 23rd days, respectively, infected mice, although the daily microscopical examination of these guineapigs was uniformly negative. The serum of these animals showed no protective properties against infection in mice. With the Californian strains, in the absence of spontaneous agglutination, little if any difference is shown in the virulence of blood taken during the primary attack and blood taken during the first three relapses.

ii. The problem of immunity in relapsing fever infections is discussed in detail with special reference to the three Californian strains. Unlike the majority of results recorded, the author found that immunity of variable duration followed the injection of spirochaetes, no matter whether the test inoculations were made with blood from the same stage of the disease as that which produced immunity, or from a different stage. Consequently, there is cross immunity between homologous spirochaetes in blood from different stages of the disease.

In vitro experiments with serum gave only inconclusive results. The inoculation of immune serum into normal mice only twice conferred absolute immunity, but in some instances caused considerable delay in the development of infection, though other mice were wholly unprotected. Cross protection was obtained between two of the Californian strains and there is little doubt that all three are identical. *S. novyi* and *S. duttoni* were found to belong to different groups from that of the Californian strains as judged by cross-immunity tests, although there may be some relationship between the latter and *S. novyi*. However, the author concludes that in his opinion such tests are not wholly reliable for the differentiation of species or groups of relapsing fever spirochaetes.

E. H.

KEMP (Hardy A.), MOURSUND (W. H.) & WRIGHT (Harry E.). Relapsing Fever in Texas. II. The Specificity of the Vector, *Ornithodoros turicata*, for the Spirochete. III. Some Notes on the Biological Characteristics of the Causative Organism.—*Amer. J. Trop. Med.* 1934. Mar. Vol. 14. No. 2. pp 159-162, 163-179. With 2 figs. [18 refs.]

The first paper deals with transmission experiments, with *Ornithodoros turicata* and strains of *Spirochaeta novyi*, *S. kochi*, *S. duttoni* and *S. recurrentis*.

In feeding experiments none of these four strains could be transmitted from rat to rat through *O. turicata*. Moreover these spirochaetes died out in the tick within a week after being ingested, as tested by inoculation of their contents into rats. It is evident, therefore, that the Texas strain of relapsing fever transmitted by this tick, differs in this respect from the four other strains tested.

The second paper concerns observations on the biology of the spirochaete of Texas relapsing fever. The spirochaetes were found to be unable to pass through a Berkefeld N candle or a Seitz filter at 40 mm. negative pressure. Cultivation experiments, using Noguchi's medium and also blood and serum mixture, both aerobic and anaerobic, were uniformly negative. The virulence of the strain was greatly increased by rapid passage using the blood as soon as it showed spirochaetes. White rats, mice and rhesus monkeys were very susceptible, but guineapigs and rabbits gave varying results. Persistence of the virus in the brain of rats over long periods of time was not observed.

The spirochaete was found to be unable to penetrate the unbroken skin of young white rats, but these animals were infected by eating material contaminated with virulent spirochaetes. It is of especial interest that the blood during the negative intervals between the attacks was highly infective, and that very small quantities of such blood produced positive results earlier and gave more pronounced infections than larger amounts of blood.

In three strains of spirochaetes from different sources in Texas, which were identical in cytolytic tests, one failed to cross-immunize with the other two. In white rats the immunity was found to persist for at least 10 months after infection. Active immunity was produced in rats by the intraperitoneal inoculation of spirochaetes killed by heat. Passive immunity was conferred by inoculation of hyperimmune sera. Hereditary immunity was not observed in the small number of rats examined.

[These two papers are an extension of the author's previous work [*ante*, p. 86] and tend to support BRUMPT's view [*loc. cit.* and below] that the spirochaete of Texas relapsing fever is biologically distinct from *S. novyi*.]

E. H.

BRUMPT (E). Essai de transmission, par l'*Ornithodoros turicata*, d'une souche de *Spirochaeta novyi*, ayant subi plus de 3,000 passages sur rats. [**Attempts to transmit a Strain of *Spirochaeta novyi* after more than 3,000 Passages in Rats, by Means of *Ornithodoros turicata*.**—*C. R. Soc. Biol.* 1934. Vol. 115 No. 6. pp. 600-602.

Nymphs of *Ornithodoros turicata* were fed on rats infected with a strain of *S. novyi* after more than 3,000 passages in these animals. The contents of these ticks were infective 2 days later but not after 3 weeks, and all attempts to transmit the infection by the bites of these ticks were uniformly negative. Consequently the author considers that either *S. novyi* is not transmissible by this species of tick, in which case it is distinct from *S. turicatae*; or that it has lost its power of developing in the tick as a result of being maintained in rats since 1906. The latter hypothesis being incapable of verification, it is considered that the name *S. turicatae* should be maintained [see above p. 86].

E. H.

SCHWETZ (J.). Note préliminaire sur la recherche des spirochètes chez les rats et les souris de Stanleyville. [**Spirochaetal Researches in the Rats and Mice of Stanleyville.**—*Bull. Soc. Path. Exot.* 1933. Nov. 8. Vol. 26. No. 9. pp. 1140-1144. With 1 fig.

The examination of more than 500 *Rattus rattus frugivorus*, the common grey house rat of Stanleyville, has never resulted in the discovery of any blood spirochaetes. On two occasions *Spirillum minus* was found in splenectomized rats. Spirochaetes were found in the bladder of 23 out of 190 rats. Their nature is left in doubt, for the author states that they were never found in the kidneys and seemed to differ morphologically from *Leptospira icterohaemorrhagiae*. Moreover, 25 guineapigs inoculated with the urine and organs of 17 rats showed no signs of infection.

Concerning mice, 71 *Arvicanthus striatus*, 37 *Lophuromys ansorgei* and *L. laticeps*, 26 *Oenomys bacchante editus*, and 2 *Leggada grada*, were examined with negative results. E. H.

TODA (Tadao) & HIROKI (Hikokiti) Beiträge zu den Studien ueber die Persistenz der Rekurrenzspirochäten im Gehirn der Mäuse. [Studies on the Persistence of Relapsing Fever Spirochaetes in the Brain of the Mouse.]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1934. Mar. 15. Vol. 82 No. 1/2. pp. 1-16. With 5 figs. [12 refs.]

Studies with four freshly isolated strains of Manchurian relapsing fever and one old strain, which confirm and extend the results previously recorded by Hiroki [*ante*, p. 88].

In spite of various attempts to modify the pathogenicity of these strains by various passages, in no case was any residual brain infection produced in mice, although the freshly isolated strains were sufficiently pathogenic for human beings but only very slightly so for mice.

The authors discuss in detail the interpretation of their own experiments and the results of other workers on this subject with special reference to PRIGGE and ROTHERMUNDT's hypothesis as to the mechanism of these residual brain infections. E. H.

SINGER (Ernst) & FISCHL (Viktor). Der Nachweis von Arsenikalien in Spirochäten und Trypanosomen. [The Demonstration of Arsenic in Spirochaetes and Trypanosomes.]—*Ztschr. f. Hyg. u. Infektionskr.* 1934. Mar. 20. Vol. 116. No. 1. pp. 36-40.

FISCHL (Viktor), KOTRBA (Jan) & SINGER (Ernst). Der Nachweis von Gold in Spirochäten und Trypanosomen. [The Demonstration of Gold in Spirochaetes and Trypanosomes.]—*Ibid.* pp. 69-71.

Details are given for the chemical analysis of the mineral content of trypanosomes and spirochaetes in order to determine the amount of arsenic or gold in these organisms after treatment with organic arsenical compounds or gold preparations. The arsenic is estimated by a modification of the Marsh test and the gold is estimated by a spectrographic method. Both in the case of trypanosome and spirochaetal infections the results of analyses at different intervals after treatment suggest that the chemotherapeutic agents unite directly with these organisms as indicated by the metal content.

The results of analyses for arsenic in trypanosomes and spirochaetes from infected mice treated respectively with atoxyl, tryparsamide and neosalvarsan are shown in the following table:—

Nagana : 1/200 gm. Atoxyl per 20 gm. Mouse

Interval after Treatment when Blood was Collected	Volume of Blood in ccs.	Arsenic Content in γ		
		Plasma	Red Cells	Trypanosomes
10 mins.	1.1	40	0.5	0.1
25 "	1.0	48	4.0	1.0
60 "	0.7	8	5.0	0.7

Nagana · 1/100 gm Tryparsamide per 20 gm Mouse

Interval after Treatment when Blood was Collected	Volume of Blood in ccs.	Arsenic Content in γ		
		Plasma	Red Cells	Trypano-somes
10 mins.	1.0	30	1.0	0.3
20 „	1.2	28	0.3	0.2
30 „	0.9	50	3.0	0.3
60 „	0.7	16	0.8	0.6
180 „	1.2	3	2.5	2.5
240 „	0.7	6	2.0	1.5

Nagana · 1/600 gm Neosalvarsan per 20 gm Mouse

10 mins	0.9	2	1.6	0.0
20 „ .. .	0.7	4	0.0	0.3

Relapsing Fever · 1/600 gm Neosalvarsan per 20 gm Mouse.

				Spirochaetes
10 mins. .. .	0.9	2	2.0	0.2
25 „ .. .	0.7	16	0.0	1.0
60 „	0.3	8	1.2	0.4
120 „ .. .	1.4	7	1.0	0.8
180 „ .. .	1.5	12	0.5	1.2
300 „ .. .	0.8	6	0.2	2.2

E. H.

FELDT (Adolf). Ueber den Metallgehalt von Rekurrenzspirochäten nach Behandlung infizierter Ratten mit Solganal und Salvarsan. Beitrag zum Problem der Wirkungsweise chemotherapeutischer Mittel. [The Metal Content of Relapsing Fever Spirochaetes after the Treatment of Infected Rats with Solganal and Salvarsan. Method of Action of Chemotherapeutic Agents.]—*Zent. f. Bakt. I.* Abt. Orig. 1934. Apr. 5. Vol. 131. No. 3/4. pp. 137-146. With 1 fig. [16 refs.]

An interesting study on the mode of action of chemotherapeutic substances in rats infected with three strains of relapsing fever spirochaetes, one normal, another resistant against salvarsan, and the other against solganal.

The infected rats were treated either with salvarsan or solganal, and 1½ to 2 hours later their blood collected, coagulation being prevented by heparin and citrate. The blood was then centrifuged for 10 minutes to remove the red cells, and then the plasma centrifuged at high speed for 2 hours to bring down the spirochaetes. The red cells and spirochaetes were washed free from the plasma and quantitative chemical analyses made of the amounts of arsenic or gold in the dried spirochaetes, red cells and plasma, respectively.

It was found that the resistant strains contained similar quantities of arsenic or gold to the normal strains, never less, a result which supports the view that salvarsan and solganal are not parasitotropic and do not act directly on the spirochaetes.

The amount of arsenic or gold found in the spirochaetes was of the same general order as that found in the dried plasma, but the red cells contained at most one-tenth this concentration. For example, in one experiment the amount of arsenic in the normal spirochaetes was 0.31, in the arsenic resistant spirochaetes 0.26, in the plasma 0.44 and 0.55, whilst the red cells contained only 0.028 and 0.029, respectively, the figures in every case indicating the number of parts per 1,000.

The action of these medicaments is considered to be through the natural defence mechanism of the animal body, and the resistance of spirochaetes to these arsenic and gold preparations to be dependent on their resistance to this defence function. Finally, the author states that the results of chemotherapeutic studies on trypanosome infections in rats and mice, are not capable of general application to other diseases, and especially not to spirochaetal infections. *E. H.*

HINDLE (E.) & WHITE (P. Bruce). **A Soluble Specific Substance in Spirochaetes.**—*Proc. Roy Soc. Ser. B.* 1934 Mar. 2. Vol. 114. No. B790. pp. 523–529 [Summary appears also in *Bulletin of Hygiene*]

Working with an easily cultivated strain of a water leptospira, *S. biflexa*, Wolbach and Binger, the authors immunized rabbits by inoculation at 5-day intervals with a rich suspension of cultures grown on a rabbit serum medium. With the anti-sera so produced fractions of the spirochaetal substance were tested, and one of them found to be highly specific. It was prepared by preliminary solution of the spirochaetes in 0.5 per cent. NaOH, extraction with industrial spirit, treatment of the filtrate with acetic acid, refiltration and treatment of the acid-alcohol filtrate with acetone. Then by a process of differential precipitation the acetone-insoluble fraction thus obtained was freed from protein and the result was a white, very soluble powder which gave no biuret reaction and is considered by the authors to be "either a carbohydrate, or at least a carbohydrate-containing substance." It reacted with anti-serum obtained as above in dilutions up to 1 in 100,000 but not with normal rabbit serum, which, on the other hand, contains agglutinins for the whole organism. The specific substance failed to react with anti-sera for six other water strains of spirochaetes or with anti-sera for pathogenic strains of *S. ictero-haemorrhagiae*. Since repeated injections of the substance into normal rabbits failed to produce any precipitating antibodies, it is considered to fall into the category of haptenes. *L. W. Harrison.*

HINDLE (Edward). **The Viability of Spirochaetes dried in Vacuo.** [Correspondence.]—*Nature.* 1934. Mar. 10. Vol. 133. No. 3358. pp. 381–382.

The author finds that it is possible to dry spirochaetes without destroying their vitality if the organisms are previously cooled to $-10^{\circ}\text{C}.$, and then dried *in vacuo* whilst in the frozen state.

Five strains of spirochaetes were tested: two culture strains of *Spirochaeta pallida*, and three strains of water leptospira. All these were found to have retained their vitality after 15 days drying *in vacuo*, and there seems no reason to doubt that they will remain alive for

much longer periods. This method, therefore, should be of value for the maintenance of strains of spirochaetes in the laboratory as it reduces the necessity for repeated subculturing. E. H.

JAHNEL (F.). Untersuchungen ueber das Verhalten der Pathogenitat von Spirochäten auf künstlichen Nährboden, insbesondere ueber die willkürliche Beeinflussung der Pathogenitat von Hühnerspirochätenkulturen. [*Studies on the Pathogenicity of Spirochaetes in Artificial Media, and Especially on Arbitrary Changes in the Pathogenicity of Cultures of Fowl Spirochaetes.*—*Zent. f. Bakt.* I. Abt. Orig. 1933. Dec. 29. Vol. 130. No. 5/6. pp. 349–357. With 1 fig. [19 refs]]

Fowl spirochaetes grown in dilute rabbit serum containing a little coagulated egg white, were found to retain their virulence for numerous passages, but in order to infect fowls it was necessary to use young cultures.

After 43 subcultures the 4-day old cultures were found to be highly pathogenic to fowls, whilst the 8, 12, 14 and 16-day old cultures were all non-pathogenic. In these older cultures although pathogenicity has been lost, the spirochaetes retain their form and motility and can continue to live in culture media. The virulence of these spirochaetes can be restored either by making a succession of cultures at short intervals—4 days or less—or by making passages in fowls. A fowl inoculated with a non-pathogenic culture showed no signs of infection, but cultures of its blood were positive. A second fowl inoculated from the first also showed no signs of infection but blood cultures were positive, but a third fowl inoculated from the second showed a typical infection. The pathogenicity of the cultures falls lower and lower according to the number of passages, and in order to recover the pathogenicity it is necessary to make subcultures at shorter intervals. Eventually the pathogenicity is lost entirely and cannot be restored, but the ordinary growth and motility of the spirochaetes seems to be unaffected.

The inoculation of these non-pathogenic cultures into fowls, immunizes the birds against subsequent injections of virulent spirochaetes. The pathogenicity of cultures falls more rapidly at higher temperatures (37°, 40°C.) than at 33°C., and by keeping them in the ice chest loss in virulence is considerably delayed. Cultures grown at 33°C. for 3 days and then placed in the ice chest for two weeks were still virulent.

E. H.

SICARD (Marcel). Sixième cas tunisien de fièvre récurrente hispano africaine. [*A Sixth Case of Spanish African Relapsing Fever in Tunis.*]—*Arch. Inst. Pasteur de Tunis.* 1934. Mar. Vol. 23. No. 1. p 48.

The record of another case of this disease in North Tunis. E. H.

GONTIER & POPOFF. Un cas de fièvre récurrente observé à Saint-Louis [*A Case of Relapsing Fever observed in St. Louis.*]—*Bull. Soc. Path Exot.* 1933. Dec. 13. Vol. 26. No. 10. pp. 1292–1293

The record of an isolated case of relapsing fever observed in a native of Sor, St. Louis. E. H.

MUHLERS (P.). **The Spirochaetoses.**—*Chinese Med. J.* 1933. Nov.-Dec. Vol. 47. Nos. 11 & 12. pp. 1384-1400.

A general account of the subject containing nothing original E H

SAURA FARGAS (Juan) Estudios sobre la quimioterapia y el mecanismo de la inmunidad en la fiebre recurrente española —*Medicina Paises Cálidos* Madrid 1934 Jan Vol. 7 No 1 pp 1-11 [33 refs] French summary (9 lines)

LEPTOSPIROSIS.

GOEZ (Yann). Diagnostic de la spirochétose ictérohémmorragique en Afrique Occidentale Française [**Diagnosis of Spirochaetosis Icterohaemorrhagica in French West Africa.**]—*Thèse de Paris*. 1933. No. 546. 92 pp. [71 refs.] [Summary appears also in *Bulletin of Hygiene*.]

The author carried out the agglutination test for spirochaetosis icterohaemorrhagica in 100 serums taken from natives of French West Africa. The specimens came from individuals who had or might have had an attack of jaundice which had been regarded as yellow fever.

In 17 cases the serum agglutinated *L. icterohaemorrhagiae* in titres ranging from 1 in 5,000 to 1 in 100 and did not agglutinate allied strains of spirochaetes. In only 3 cases was coagglutination found with the Tokio strain and the *Autumnalis* A strain. In all but one case it was impossible to find the presence of lysins for *L. icterohaemorrhagiae*. The absence of these lysins does not prove that the organism is different from *L. icterohaemorrhagiae* or one peculiar to Africa, as the author's experiments on serum taken from old cases of spirochaetal jaundice showed an absence of lysins. Goetz concludes that spirochaetosis icterohaemorrhagica does not exist in French West Africa and that there is no reason for supposing that the clinical forms are different from those met with on the continent of Europe. The diagnosis from other fevers associated with jaundice merely requires the agglutination test.
J. D. Rolleston.

APPELMAN (Johan Maurits). Het isoleeren van *L. icterohaemorrhagiae* uit water. Bijdrage tot de kennis van de epidemiologie van de ziekte van Weil. [**Isolation of *L. icterohaemorrhagiae* from Water. A Contribution to the Epidemiology of Weil's Disease.**] [Thesis for Doctorate of Medicine at Leiden University.]—116 pp. [4 pages of refs.] 1934. Leiden: N. V. Leidsche Drukkerij-Morschsingel 14-15.

This treatise gives a very clear account of the laboratory work which has been done on infectious jaundice, or Weil's disease.

A controversy, similar in many respects to the case of cholera, centres round the question whether the water spirochaete, *L. pseudo-icterogenes* is or is not identical with the pathogenic *L. icterohaemorrhagiae*, and the author pronounces in favour of their being different organisms. Much of his work is occupied with the technical methods of testing for the presence of *L. icterohaemorrhagiae*. The mouse is quite a suitable animal to use for this purpose and the organisms may be found in the peritoneal fluid after intraperitoneal

injection. Not only so—and this is important diagnostically, especially for an avirulent strain—the serum may show the evidence of infection by an agglutination-lysis test even if the peritoneal fluid fails to do so. One of the chief contributions of the author to original work on his subject is his “bath” test for the isolation of *L. ictero-haemorrhagiae* from water and its separation from *L. pseudo-icterogenes*. A guineapig is the animal used. After shaving and scarifying the abdomen the animal is placed in a glass dish and about 3 litres of test water, warmed to 30°C., filled into the dish until it reaches to the flanks of the animal. In this it continues sitting for an hour, after which it is placed, without drying, in a warm cage for 5 hours. Artificially infected water was used in the experiments and the minimum degree of infection which was successful amounted to one leptospira per 3 cc. water. Success was also obtained with ditch water. The disease ran an especially acute course when infection took place with natural water. After an incubation period of 6 to 10 days according to the number of leptospirae present, the temperature rises to above 40°C. On the second day the fever sinks. Severe jaundice sets in on the third day and then on that day or the next death supervenes. The *Leptospira pseudointerogenes*, which may be present in abundance in the water under test is not at all pathogenic and consequently the organism isolated from the organs of the animal dead of Weil's disease is pure *L. icterohaemorrhagiae*. It would seem therefore that the author has surmounted the difficulty of proving the presence of *L. icterohaemorrhagiae* in water, even if it contain *L. pseudoicterogenes* and be highly contaminated with faecal organisms. *W. F. Harvey.*

TROISIER (J.), BARIÉTY (M.), ERBER (B.) & GABRIEL (P.). Existe-t-il une spirochétose occulte d'origine hydrique? [Is there an Occult Spirochaetosis of Water Origin?]*—Bull. et Mém. Soc. Méd. Hôpît. de Paris.* 1934. Jan. 22. 50th Year. 3rd Ser. No. 1. pp. 26-29.

The authors tested the serum of a patient convalescent from a phlegmonous angina, and found that it agglutinated the Verdun strain of *Spirochaeta icterohaemorrhagiae* up to dilutions of 1/100. This patient had never shown any signs of spirochaetal jaundice, but was devoted to aquatic sports and it is suggested that he might have acquired a purely latent infection from the water. *E. H.*

MORIGUCHI (Takeji). The Effect of Bismuth upon Experimental Akiyami.—*Japanese Jl. Experim. Med.* 1933. Aug. 20. Vol. 11. No. 4. pp. 353-356. [31 refs.]

Akiyami is a spirochaetal disease resembling but not identical with Weil's disease. The authors have found that 1 per cent. solutions of “tartaro-bismuth potassium sodium” have a positive effect when injected into guineapigs 48 hours after inoculation of the spirochaetes.

D. H.

RAT-BITE FEVER

VASSILIADIS (P.). Découverte du *Spirillum minus* en Egypte. [The Discovery of *Spirillum minus* in Egypt.]—*C. R. Soc. Biol.* 1934. Vol. 115. No. 4. pp. 444-446.

The author found specimens of *S. minus* in the blood of a splenectomized rat (*Mus norvegicus*) captured at Suez. The blood was negative 3 days after the operation and positive on the 6th day. A guinea-pig inoculated subcutaneously with the blood of this rat failed to become infected. E. H.

ARIMA (Shizuka). Experimental Inquiry into the Transmission of Rat-Bite Fever among Rats : Part I.—*Philippine Jl. Sci.* 1933. Oct. Vol. 52. No. 2. pp 89-95.

Fleas [species not stated] were fed on rats infected with the Manila strain of *Spirillum minus* and subsequently tested for infectivity. The spirilla remained alive for one hour after ingestion and also retained their infectivity, as tested by inoculation into guineapigs, but after longer intervals failed to produce any infection. Attempts to transmit the disease by the bites of infected fleas gave uniformly negative results. E. H.

BLACHER (W.). Ueber Spirocidbehandlung der Rattenbisskrankheit (Sodoku). [The Spirocid Treatment for Rat-Bite Fever (Sodoku).]—*Muench. Med. Woch.* 1934. Apr. 20. Vol. 81. No. 16. pp. 591-592. With 1 chart.

The description of a case of sodoku in a 2 year-old-boy, who was given varying doses of spirocid. Small doses ($\frac{1}{4}$ tablet) seemed to provoke a febrile reaction, but the treatment was continued and the dose gradually increased to 2 tablets. After 2 months the patient was cured without any secondary toxic symptoms having developed although 9 gm. of the drug had been given. E. H.

REVIEWS AND NOTICES.

CHRISTOPHERS (S. R.), SINTON (J. A.) & COVELL (G.). **How to do a Malaria Survey.**—*Health Bull. No. 14. Malaria Bureau No 6.* Calcutta 2nd Edition 1931 pp. iv+174. With 11 plates & 3 figs [As 10 or 1s]

This book was originally issued in 1928 as a guide for students of malaria in India, and more especially to aid those attending the malaria course of the Malaria Survey of India. It is an indispensable guide for those engaged on malaria surveys, and it is not surprising that the first edition was exhausted within a year. The new edition contains many valuable additions such as methods for making permanent preparations of larvae, and of the infected gut of mosquitoes. There is also a table for differentiating between the parasites of human and avian malaria, and a note on the use of the precipitin test as a means of determining the source of anopheline blood meals. Other additions are Sinton's method of estimating the amount of quinine in medicinal solutions, by the use of Tanret's reagent and Brown's barium sulphate opacity tubes, a field method for estimating the salinity of water, and a note on the construction and use of Barraud's cages for the transport of mosquitoes. A list of the Indian anopheles is given which shows their distribution, breeding places, and importance with regard to malaria. *A. culicifacies*, *A. listoni*, *A. ludlowi*, *A. maculatus*, *A. minimus*, and *A. stephensi* are starred as the most important carriers. An index is another useful addition.

Some alterations have been made in those sections of the book which deal with the enlarged spleen, and with the "terms and conceptions" used in malaria work; the invaluable chapter on the dissection of mosquitoes remains unaltered. Two sections, the one dealing with the equipment of the field laboratory and the other with the preparation of maps, have been moved from the middle of the book to the appendix. This has caused some confusion in the cross references; for instance, on p. 13, section X should read section VIII, on pp. 38 and 40, VII should be VI, and on p. 66, sub-section (d) should be appendix XIII.

The new edition ends with the same wise words as the old one: "It is easy enough to recommend the oiling, etc., of all breeding places in an area, but not so easy to arrange that this will be correctly carried out during the year. It is in regard to the last part of the arrangement that the plans of the malaria officers are usually lacking in definiteness."

W. Fletcher.

BARRAUD (P. J.) [F.E.S., F.Z.S., F.L.S., etc.]. **The Fauna of British India, including Ceylon and Burma. Diptera. Vol. 5. Family Culicidae. Tribes Megarhinini and Culicini.**—pp. xxviii + 463. With 106 figs., 8 plates and 1 folding map. Published under the Authority of the Secretary of State for India in Council. Edited by Lt.-Col. R. B. S. SEWELL, C.I.E., Sc.D., I.M.S., assisted by F. W. EDWARDS, M.A., Sc.D. 1934. Mar. London: Taylor & Francis, Red Lion Court, Fleet Street.

CHRISTOPHERS' account of the Indian Anophelines* has been followed at a very short interval by the present volume, which deals

* The reviewer was in error in stating (this *Bulletin*, Vol 31, p 74) that *Anopheles stephensi* "ranges eastwards through the Malay States and the East Indies."

with the rest of the mosquitoes (Megarhinini and Culicini), also with the related Dixinae and Chaobornae which are not of medical importance.

In the present volume, Captain Barraud discusses about 300 species of which approximately 250 are Culicini. It follows that a large part of the work is purely systematic, and that general and introductory matter has been reduced to a minimum, but the introductory chapters to the volume by CHRISTOPHERS apply for the most part to the insects which are here considered. In spite of Captain Barraud's investigations on Indian Culicine mosquitoes, which have continued for about a dozen years, there seems little doubt that many species still remain unknown—indeed, the present book contains an appendix describing half a dozen which were discovered while the work was passing through the press. But it is certain that the present volume will remain a standard authority for many years to come, and workers in India, and indeed throughout the Oriental region, must be extremely glad of its publication.

The systematic entomologist will note with pleasure that the larvae of most of the Indian Culicines are known though 96 remain to be described. One observes also short descriptions of some of the pupae and eggs. The excellent photographs which appear on plates at the end will render the identification of many species, particularly of the subgenera *Finlaya* and *Stegomyia*, an easy matter. Those who have used Barraud's long series of systematic papers are already familiar with his excellent photographic work.

To the medical reader the volume is of rather limited interest, though it has considerable potential value in relation to yellow fever, dengue and filariasis: also because of the irritation caused by domestic mosquitoes. One might be glad of more detailed information about the distribution of *Stegomyia aegypti* in the Indian Empire: we are told that it is widely distributed and the map of its distribution bears this out, but is it found only in ports and large towns (perhaps by way of railway lines) or is it found also in remote villages throughout the country?

The volume, which is very well illustrated by text-figures, concludes with a folding map of the Indian Empire and Ceylon.

P. A. Buxton.

FISCHL (Viktor) & SCHLOSSBERGER (Hans). **Handbuch der Chemotherapie. Zweiter Teil. Metallderivate.** [Handbook of Chemotherapy, Part II. Metallic Derivatives.]—pp. xi+359-898. 1934. Leipzig: Fischers medizinische Buchhandlung. [M.55.]

The first volume of this compendious handbook of Chemotherapy, which deals with non-metallic organic derivatives, was reviewed in this *Bulletin*, 1932, Vol. 29, p. 733. The second volume contains an account of those chemotherapeutic substances which owe their activity to the presence of a non-metallic radical. The most important sections naturally deal with arsenic and antimony, but full consideration is also given to bismuth, iodine, copper, gold and mercury. The chemotherapeutic action of some 48 other elements is also mentioned.

The use of each element is first of all considered from an historical aspect. Arsenic in the form of a sulphide was originally used by Hippocrates as an application to boils: the virtues of iodine were early appreciated by the Chinese, perhaps the result of a racial tendency to

slight thyroid deficiency which, if Keith's view be correct, is responsible for many of their physical characteristics. Gold was much esteemed in India centuries before the Christian era. The history of each metal is followed by a consideration of the chemotherapeutic use of the free metal and of its various compounds inorganic and organic. Pharmacology, chemical constitution, mode of action and toxicity for animals are fully dealt with, while appended to each chapter is a very complete bibliography. Even in the case of an element such as gold the bibliography comprises between eight and nine hundred references. As all these references are also mentioned in the text it follows that at times reading is no light matter, especially when compact lists of from forty to sixty names are encountered. From what has already been said it is obvious that the book is of an encyclopaedic character and, as a work of reference, it will prove invaluable. If perhaps any sections lack exhaustive treatment it is those which deal with the pathological lesions produced by chemotherapeutic agents. Thus, in considering the toxic action of the arsphenamines, no reference is given to the Medical Research Council's two special Reports. Phelps's analysis of the effects of nearly 200,000 doses of neoarsphenamine administered in the U.S. Navy also passes unnoticed. The use of the symbol \emptyset will not be familiar to all, while in none of the seventeen tables where it occurs is its exact significance explained.

The book closes with an index of all the chemical compounds mentioned in this and the preceding volume

G. M. Findlay.

WU LIEN-TEH, CHUN (J. W. H.), POLLITZER (R.) & WU (C. Y.).
Cholera. A Manual for the Medical Profession in China.—
pp. xxii + 197. With 1 colour & 23 half-tone plates. 1934.
Shanghai, China: National Quarantine Service, 2 Peking Road.
[Cloth 12s; paper 10s 6d]

This manual is the first of a series on the commoner epidemic diseases of China and should provide a sound guide on technique, treatment and prevention. Each author deals with a special section. The first of these is an interesting historical and epidemiological discussion by Dr Wu Lien-Teh, Director of the National Quarantine Service. In the oldest work on Chinese medicine, about 2,600 B.C., there is mention of a disturbance of the alimentary tract which is given two script characters, "Huo luan." The term represented a syndrome of cholera and cholera-like affections. It was not however "until the latter half of the Ch'ing (Manchu) Dynasty (1644-1911) that symptoms relating to cholera were mentioned in detail." An important chapter on the laboratory aspects of cholera follows in which, besides the morphology, the biology of the vibrio receives adequate presentation. A very satisfactory feature of this chapter is the cautious way in which the author deals with the controversial subjects of immunization in cholera, transmutation of vibrios and the rôle of cholera carriers. This manual is not intended for the laboratory worker only. It also deals with the clinical aspects of the disease, including treatment, in part three. In a country like China and with a disease like cholera where the people themselves must be persuaded to co-operate with public authorities, if the disease is to be prevented from assuming epidemic proportions, education and propaganda will naturally require special attention. This subject receives treatment in part four. "A vast, little developed field lies

before the educational and publicity health worker in China. He is confronted at the very outset with the problem of four hundred million human beings steeped in millennium-old customs and superstitions." Many methods of publicity are considered. Sky writing by aeroplane, however, is evidently not considered worth attempting owing to the complicated architecture of the Chinese language. An appendix on the spread and control of sea-borne cholera concludes this praiseworthy and serious attempt to provide detailed instruction for the medical profession in China on one of the most terrifying, fatal and at the same time most preventable diseases of mankind.

W. F. Harvey

PINEY (A) [M.D., M.R.C.P., etc.]. **Blood Diseases in General Practice.**—92 pp. Pocket-Monographs on Practical Medicine 1934. London: John Bale, Sons & Danielsson, Ltd. [2/6]

It is much more difficult to write a small book on a large subject than a large book on a small subject. There is already a number, almost a library, of works on Haematology and this additional "pocket-monograph" does not occupy much space, but whether it will "fill the gap in our literature," as the author hopes, is not for us to prophesy. He disarms criticism by stating in a short preface that he is well aware of the incompleteness of the book.

The work is difficult to place. If it is "to stimulate interest in blood diseases," it might be expected to rate as an elementary introduction, but it is not this since it is "taken for granted that the reader has some knowledge of the various types of blood-cells." It is obviously impossible to convey much information on the blood, the anaemias, leukaemias, haemorrhagic diatheses, lymphadenoma, splenic diseases, infectious mononucleosis and agranulocytosis, together with the treatment of them in 90 small pages. Industrial poisons too are not omitted. Agranulocytosis is probably the most important of blood conditions of recent times in which the practitioner needs information, but the treatment suggested is too indefinite to be of much assistance. Stimulation of the marrow by "exposure of the long and flat bones to very small doses of X-rays" and the use of pentnucleotide "which should be injected intramuscularly every day" till reaction is obtained, are the chief but no indications are given as to dosage. There are some useful hints on the administration of iron.

The blood changes, anaemias and infections leading to them, such as are commonly met with by those practising in tropical countries are not touched upon.

H. H. S.

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MALARIA IN MAURITIUS.

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(Received May 28, 1934.)

The Colony of Mauritius is a volcanic island 716 square miles in area (nearly equal to Surrey) lying in the South Indian Ocean just inside the tropic of Capricorn and at a distance of nearly 1,400 miles from the east coast of Africa. It lies between latitude 19 deg. 50 min and 20 deg. 35 min. South, and longitude 57 deg. 18 min. and 57 deg. 48 min. East, of Greenwich.

In general shape, the island, as the late Sir Andrew BALFOUR has aptly written, is not unlike an oyster, the broader end being the southern portion. The general configuration of the land is a belt of low-lying country extending practically all round the periphery and rising more or less gradually to a central plateau of an average height of about twelve hundred feet, though in the middle of the island the land lies higher. The central plateau comprises about a fifth of the total area. There are three main ranges of hills, which account for the peculiarly localized distribution of rainfall which is so striking a feature in the Colony.

Soil and Subsoil.

Mauritius being of volcanic origin, the rocks are igneous and the more superficial consist of lava of varying degree of permeability. In some regions underground caverns exist and the whole subsoil seems to be composed of a material resembling a huge bath sponge containing cavities varying from tiny pores to caverns as large as a dwelling house. This is more or less the case in the northern half of the central part of the island where the soil as a rule is well drained by natural means and, in consequence, absorbs water with avidity. There are, however, other places where the soil and subsoil are much less pervious, where the water table is near the surface and where surface water finds difficulty in being absorbed. On the coastal regions there are many large marshy areas below or just at sea level which cannot be drained.

In many places such as the beds of streams, or outcrops of lava along the coast where the rock is bare, the surface of the rock is pitted with innumerable cavities of varying size which retain water and constitute mosquito breeding-places most difficult to eradicate or to control.

Climate.

The climate generally is that of a sub-tropical island, mild and equable. But there is a remarkable diversity of climate in the island. The eastern seaboard is hot and moderately humid most of the year, in the middle of the island the heat is tempered by altitude, whereas on the western coast the climate is hot and dry. The diversity is due to the configuration of the land and the direction of the prevailing wind. The island lies in the region of the trade winds.

There are two seasons, a cool and a warm, the change from one to the other being fairly abrupt and more noticeable on the central plateau than on the coast. The warm season lasts from November to April, which is also the season of cyclonic storms in this part of the Indian Ocean. Cyclonic storms are accompanied by torrential rains during which a rainfall of eight to ten inches may be recorded in 24 hours, and by high winds blowing in violent gusts, with frequent changes in direction. These storms generally result in a considerable amount of flooding and damage to crops and other property.

Population.

The 1931 Census recorded the total population of the Colony as 393,238 persons. Of this number, 268,649 were of Indian race, 8,923 were Chinese, and the remainder, 115,666, comprised the General Population. The term "General Population" includes all persons in the Colony not classified as Indian or Chinese. In this group are to be found those of pure European descent, the remnant of the original African and Malgache races, and a large group of persons of mixed race.

The distribution of the population is roughly as follows. Most of the Europeans reside on the central plateau. The population of mixed race are to be found mostly in Port Louis, the townships and villages. The Chinese are ubiquitous; they are retail shopkeepers whose shops are to be found all over the island. The Indians are predominantly agricultural and reside for the most part in the coastal low-lands, in villages and in estate lines. The western part of the island is most sparsely populated, the most densely populated part being the central plateau, if we exclude the town of Port Louis. The mean density of population is about 550 per square mile for the whole Colony.

Language.

Educated persons are at least bilingual, the two main languages being French and English, with this difference, that French is the language spoken in the home, English the acquired language.

Amongst the illiterate the mother tongues are those of their own people, but there has been evolved from the old slave patois, based on the French language and known locally as the Creole dialect, a *lingua franca* spoken by practically everybody, which is easy to learn, racy in its idiom and of general utility. It is really the language of the people and it has been adopted and evolved to meet the same need for social intercourse as Hindustani and pidgin English do in other parts of the world.

Industries.

The cultivation of the sugar cane and the manufacture of raw sugar are the staple industries of the Colony. This has an important bearing on the distribution of the population. The only town of any size is Port Louis, which has approximately 54,000 inhabitants. The rest of the population, with the exception of those inhabiting Plaines Wilhems district, are distributed throughout the Colony in the agricultural areas. Rum is prepared for local consumption, as a by-product of the sugar industry. Tobacco is grown to some extent, and there is a modest production of aloe fibre for export. In the north and west agriculture requires irrigation. In other regions irrigation is not necessary on account of the more frequent occurrence of rain.

Housing.

The more wealthy inhabitants live in wooden frame buildings, usually raised well off the ground by a masonry plinth. Under-floor ventilation is the rule and such houses are dry and cool. The common roofing material is the wooden shingle. Cement concrete is just coming into vogue as a building material for domestic construction. The houses of the wealthier classes are situated in extensive compounds, tastefully laid out in front in lawns and flower beds. At the back, or to the side of the house, within easy reach, are the servants' quarters. It is the rule for servants and their families to live on the premises of their employers.

The buildings of the middle classes follow the same general lines as those of the wealthier, but on a smaller and more congested scale. Fowls are to be found on most premises.

The labouring classes live in huts of simple design, usually built on a plinth of stones, having walls of wood or, more commonly, ravenal, and a roof thatched with dried cane tops. Most huts have a little verandah. Cooking may be done on the verandah or in some adjacent shack. It is seldom done inside the hut, except in stormy weather.

The housing provided by the sugar estates for their resident labourers is generally more substantial and sanitary than the labouring population can provide for themselves. The general type of estate housing consists of rows of two-roomed dwellings, provided in front with a continuous verandah which the occupiers may or may not partition off at their convenience. The rows are generally set on a masonry foundation, the buildings constructed of wood or galvanized iron on a wooden frame, with a roof of thatch or galvanized iron. Some estates construct stone buildings, which are more permanent and less liable to damage from cyclones. Back-to-back buildings are prohibited and are now rare. The estate managers are held responsible for ensuring that no rank vegetation is allowed to grow within ten feet of the labourers' lines.

Communications.

External.—Steamship communication with Europe, though regular, cannot be described as good. Letter mails to and from Europe take at least a month on the way. Parcel mails require anything from six weeks to two months.

Internal.—The Mauritius Government Railways now maintain regular passenger and goods services over approximately 100 miles of railway. There is also an excellent system of good roads which renders any inhabited part of the island readily accessible. The main roads

are tarred and carry a prosperous motor omnibus and lorry traffic. The bus is greatly used by the poorer classes, who now find places in the island accessible to them which were formerly within the reach only of those fortunate enough to possess private motor transport. The great increase in rapid and cheap road transport is undoubtedly a factor which must be reckoned in studying malaria in the Colony. The rivers are not navigable.

Administration.

The constitution is that of a Crown Colony.

For political and administrative purposes the Colony is divided into the following nine districts whose main features are summarized in the table.

District	Situation	Altitude	Area in sq miles	Population 1931	Climate
Port Louis ...	North West	Coastal	16.5	54,435	Equable humid hot
Black River ...	West	Coastal	100.0	14,263	Equable dry hot
Pl Wilhems ..	Central	Above 600 ft	78.5	95,258	Variable humid cool
Savanne ...	South West	Coastal	94.5	31,101	Equable humid hot
Grand Port ...	South	Coastal	100.5	48,619	Equable humid hot
Flacq	East	Coastal	115.0	52,640	Equable humid hot
Moka ...	Central	Above 600 ft	89.0	29,283	Variable humid cool
Rivière du Rempart	North East	Coastal	57.0	30,792	Equable dry hot
Pamplemousses	North	Coastal	69.0	36,847	Equable dry hot

In the column "Climate" the terms "equable," "hot" and "cool" are to be read relative to the situation of the Colony. "Equable" denotes that there is little appreciable difference between the day temperatures of the cool and hot seasons. "Variable" means that there is a distinct cool season as compared with the hot. Really hot and oppressive nights are rare anywhere in the Colony.

Plaines Wilhems and Moka are the only districts lying wholly within the central plateau. All the other districts extend to the sea.

The Medical and Health Department.

At the present time the Medical and Health Department is in a transitional stage of organization from the former type to the Health Centre type described by the writer in 1931. Roughly the organization is as follows: To each district there is posted a medical officer known as a Health Officer whose principal duties are the care and treatment of the sick poor and the administration of the sanitary law in his district. He is required to reside in his district and is in charge of the small hospital (of which there is one in each district except Black River), and its satellite dispensaries. It is intended that the dispensaries shall be the nucleus of the Health Centres of the district.

The District Health Officer is in charge of the subordinate medical and sanitary staff and he will ultimately be responsible for the measures

for the preservation of the health of all persons resident in circumscribed areas of his district, in each of which will be established a Health Centre. In the intervening areas the population is comparatively sparse and, as the main diseases affecting the public health are hookworm disease and malaria, these will be dealt with by the Malaria-Hookworm Branch of the Department, about which more will be written in a later part of this article.

In addition to the district hospitals there are three central hospitals, which are equipped for modern operative and electro-medical treatment. There are also a mental hospital and a small hospital for the detention and treatment of lepers. There is a central laboratory which undertakes general pathological diagnostic and bacteriological work, the analysis of food and drugs and medico-legal investigation.

History of Malaria in Mauritius.

Of the three main islands of the Mascarene group, Rodrigues is the only one in which anopheline mosquitoes do not now exist. There is therefore a very strong presumption that the anopheline genus was introduced from either Madagascar or the neighbouring continent of Africa. At the present day there are four anopheline mosquitoes known in the Colony, viz. : *A. costalis*, *A. maculipalpis*, *A. mauritanus* and *A. funestus*. So far as is known to date, *A. mauritanus* is not a transmitter of malaria in the Colony; *A. maculipalpis* was infected frequently by MACGREGOR (1924), who also found no difficulty in infecting *A. costalis*. ROSS and his co-workers also found little difficulty in infecting the last species. MACGREGOR further established that *A. funestus* could be infected locally quite as easily as *A. costalis*.

So far as malaria itself is concerned, the first indigenous outbreak occurred in the Black River District, in November 1865 at a place called Petite Rivière. From this centre the disease spread along the coast, both northwards and southwards. Port Louis was infected in January 1866, and the most northerly part of the island in December of that year. In 1867 it reappeared in most of the low-lying country where it had previously occurred and appeared for the first time in certain parts of the interior. The disease had encircled all the coastal belt by the end of 1868.

The 1867 epidemic of malaria was a remarkable example of how deadly a disease malaria can be when it attacks a susceptible population deprived of quinine. The Port Louis District suffered the worst. More than 20 per cent. of the total inhabitants died in 1867 from malaria alone. At that time the town of Port Louis had some 87,000 inhabitants and the monthly numbers of deaths were as follows (FOWLER) :—

Port Louis : Deaths from Malaria.

1866				1867							
Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
288	309	337	371	1,208	3,812	6,224	4,970	2,059	1,296	620	463

The disease never again regained its former virulence; the Colony had profited by the lesson and thereafter there was always an adequate supply of quinine available.

This epidemic greatly stimulated the development of the central elevated plateau as a residential area. Before 1857 Port Louis and the neighbouring district of Pamplemousses were the residential parts of

the Colony. The interior was practically uninhabited. After the epidemic many of the wealthier inhabitants settled in Curepipe which, in course of time, became the residential capital of the island, though Port Louis has retained its importance as the seat of government and the commercial capital of the Colony. The advent of plague in 1900 induced many more residents to forsake the town for the interior and now most people who can afford to do so reside in the chain of townships—Curepipe, Quatre Bornes, Rose Hill and Beau Bassin and the villages of Vacoas and Phoenix, which extend in a northern direction from Curepipe in the middle of the island to Port Louis on the north-west coast. They are linked by road and rail, and there is an excellent service of trains and buses between them and the capital.

From its introduction until 1908 malaria was confined largely to that area of country lying below the 600 foot contour. DAVIDSON, in 1892, writes as follows: "At the present day, fever can only be said to be generally endemic below 500 or 600 feet, although in some particular localities it reaches higher elevations than these." But it was gradually ascending, and by 1906 had attained the highest part of the island.

In 1907, Sir Cavendish BOYLE, the then Governor, caused Ross to visit Mauritius "in order to report on measures for the prevention of malaria there." The War Office at that time maintained a considerable garrison in the Colony and issued orders concurrently to Major C. E. P. FOWLER, R.A.M.C., to accompany Major Ross for the purpose of assisting him generally, and especially with regard to the measures to be taken for the protection of His Majesty's troops. Each subsequently published a report, Ross dealing with the civil population, FOWLER with the military. Taken together they constitute a classic on the subject of malaria in Mauritius.

Ross spent three months in the Colony, from 20th November 1907 to the 28th February 1908. His report was published in that year. He found that Mauritius was one of the first places in the world in which the mosquito transmission theory had been made the basis of anti-malarial operations and that two local entomologists, Messrs Daruty de GRANDPRÉ and d'Emmerez de CHARMOY had in May 1900 correlated the distribution of malaria in Mauritius with that of *A. costalis*. He also found that, as an anti-mosquito measure, a certain amount of work had been undertaken to clear streams clogged with vegetation and that quinine was distributed free in malarious areas.

As a result of his study Ross laid down a plan of campaign involving the following procedures:—

- (a) A periodical spleen census of children in schools and on estates.
- (b) Treatment of children with enlarged spleens in schools and on estates, and a certain amount of quinine distribution.
- (c) Occasional house protection.
- (d) Mosquito-reduction where advisable (a) by minor works, (b) by major works.
- (e) A suitable organization and an annual malaria report.

While Ross was in the Colony the anti-malarial measures which he advocated were carried out with great vigour. But after his departure enthusiasm gradually waned and attention ultimately became focussed upon drainage and canalization as anti-malaria works to the detriment of the other measures which Ross had advocated. The Government undertook the construction of major works (often in areas where Ross

himself would have hesitated to advocate them), without due consideration of the dictum laid down by him, "minor works before major works" Ross himself stated that :—

"It would be folly to commit the Colony to a large capital expenditure until the absolute necessity for this becomes quite apparent; and it cannot become apparent unless the minor works and other methods of prevention have been tried for some time, . . . Then, if and where the major works are found to be necessary or economically advisable, they should be carried out. But to rush upon the major works without such preliminary experience would be unwise, except in cases where the necessity for them is already quite obvious"

It need occasion no surprise that the single-handed efforts of the government departments concerned made little appreciable difference to the general malaria situation, though certain localities undoubtedly benefited. The Government became the scapegoat of a population which seldom showed any inclination to reinforce the effect of work done by the Government Departments by undertaking on its own premises the ancillary works which were necessary to render major works effective. Even in recent times the presence of mosquito nuisances upon private premises has deprived the occupiers of the benefit of important major works executed in their neighbourhood. In spite of these difficulties, and of occasional hostile criticism, the Government persisted in its attempts to apply some, if not all, of Ross's recommendations, until in 1921 the unsatisfactory sanitary state of the Colony as a whole led the Government to obtain the services of the late Sir Andrew BALFOUR to advise in what way a sum of at least Rs.10,000,000 might be spent to the best advantage upon sanitary measures.

BALFOUR spent six months in the island and as a result of his visit issued his classical Report on Medical and Sanitary Matters in Mauritius. In this he made an important contribution to the study of malaria in the Colony which has since become the basis of the anti-malaria policy of the Government, on which the new campaign has been founded. His significant observation is recorded as follows: "Without entering into details I may say that I was greatly struck by the way in which, during the winter, the breeding area of *Anopheles costalis* became restricted." Lack of time prevented him from following up this observation but he was instrumental in obtaining the services of the late M. E. MACGREGOR, an expert field entomologist, who worked in the Colony from June 1922 to June 1923. MACGREGOR thus spent a full year in Mauritius and was able to confirm and give more precision to Sir A. BALFOUR's observation regarding the restriction of Anopheline breeding-places during the cool season. He also discovered that *A. funestus*, a notorious malaria transmitter, was present in the Colony and that it had a widespread distribution.

MACGREGOR's observation on the seasonal restriction of anopheline breeding was recorded as follows :—

"*Anopheles costalis* in Mauritius, in the regions above (i.e., 600 feet) the coastal belt, survives the winter not by hibernation but by the adoption of sheltered 'winter refuges,' where, restricted to the immediate vicinity of these winter refuges, it pursues the regular course of its life until, with the onset of warmer weather and the coinciding wet season, it is enabled to spread speedily further inland to the limits of its summer distribution. Conversely, with the onset of the colder weather in the following autumn and the drying up of many of the breeding places in the ensuing dry season,

those individuals who happen to be outside the sites of the sheltered winter refuges are exterminated."

He also recorded the absence of *A. funestus* at altitudes above 500 feet.

MACGREGOR was an entomologist and it is only natural that his recommendations should have a strong entomological bias. He omitted any reference whatever in his report (1924) to patients or plasmodia, either because he considered that the existing provision for the medical care of the population was adequate to deal with that side of the problem, or because he deliberately omitted these considerations as being unimportant. His recommendation was, briefly, that a special Anti-Malarial Department be organized, staffed principally by entomologists of various grades and provided with engineering, financial and clerical branches. The scheme of campaign was to deal firstly with what he described as the inland winter refuges which were to be found all over the central inland area between the altitudes of 600 and 1,200 feet. He estimated that one cool season would suffice for this work, as he considered that these refuges were neither very numerous nor difficult of eradication. Thereafter, the abolition of anopheline breeding-places in coastal areas was to be undertaken in a series of triangular areas, their apices lying in the middle of the island, their bases formed by the coast line. He stipulated that only proved anopheline breeding places were to be dealt with, other mosquito nuisances being left alone.

This plan of campaign looked very impressive on paper, but, apart from a number of administrative features which were quite impracticable, it appeared to me to be based on the ingenious assumption that neither of the principal anopheles with which it was concerned had any power of adaptability. It also implied that the year during which the survey was made might be regarded as an average year regarding rainfall and other climatic factors. These were very big assumptions and they were not supported by anything which was known of the factors concerned. On the contrary, the wide geographic range of both *A. costalis* and *A. funestus* showed that those species must possess a very high degree of adaptability, and to assume that the members of those species occurring in Mauritius should have lost such an important biological asset was relying too much upon appearances and disregarding a considerable accumulation of knowledge. There was no evidence that if one breeding-place was abolished the species could not adapt itself to another. The assumption regarding the climate was also unsupported by experience. The only consistent feature about the Mauritius climate is its inconsistency. There is no such thing as an average year, and so far as malaria is concerned, the advent of a cyclone of moderate severity may change anopheline distribution in the Colony in a few weeks. The cost of the abolition of anopheline breeding-places in the coastal belt was far beyond the possibilities of the colonial budget even at that time.

These objections, though not actually recorded at the time, undoubtedly prevented the immediate inception of the campaign associated with MACGREGOR's name. However, in the beginning of January 1927, it was decided to institute a systematic campaign based on MACGREGOR's recommendations. The anti-malarial work of the Medical and Health Department then fell into two categories.

(a) The maintenance of works that had been carried out in accordance with Ross's recommendations.

(b) The prosecution of the first part of the MACGREGOR campaign. For this, a new staff was organized, largely consisting of men who had

worked in association with MACGREGOR when he made his survey. The first stage of the new campaign was to be devoted to propaganda in the area of the proposed operations and a re-survey of the inland winter refuges. Major works begun under the Ross plan were to be completed but no new major works were to be undertaken until the winter refuges had been surveyed, and an estimate made of the cost of their eradication.

These good intentions were shattered by a malaria scare at Curepipe which, hitherto, had been regarded as being malaria-free for all practical purposes. As this town is regarded as the sanatorium of the island the occurrence of locally contracted malaria in it led to an immediate outcry for the expenditure of Government money, though a number of cases had been contracted in association with breeding-places occurring on private premises. One family were infected by mosquitoes which had apparently hatched in the domestic fowl-run, careful search having failed to discover any other breeding-place in the vicinity. The scare, however, provided an excellent opportunity for a comparison between the cost of a work recommended by Ross and estimated by him at Rs 18,000 and its actual cost, which in 1930 was nearly Rs 72,000. MACGREGOR, wisely perhaps, made no estimates of cost.

While this was going on the "Inland Winter Refuges" were surveyed. In 1927 their numbers had increased from the 10 recorded by MACGREGOR to 61. The estimated cost of their eradication was Rs 432,000, and this in the least malarious part of the Colony! From 1928 to 1931, the same survey work was carried on and the "refuges" mounted steadily in numbers until by 1931 they numbered 128, of which 65 could be reckoned as recurrent nuisances, the others being merely seasonal and unlikely to recur during the next cool season. Moreover, indigenous malaria was now occurring in places from which it had formerly been absent.

During this period the financial state of the Colony had greatly deteriorated so that the Government was faced with the urgent need of curtailing expenditure in every department in order to obtain a balanced budget. The activities of the Medical and Health Department could not escape the pruning knife and drastic measures were taken to curtail expenditure.

The only virtue of an economic slump is that it shakes one out of comfortable, unprofitable routine and brings one face to face with essentials. And there is no subject in tropical hygiene in which the importance of a firm grasp of essentials is so vital as in malaria. As I have written elsewhere (1931), routine measures, based on general epidemiological principles, will always take us a certain distance on the path of sanitary salvation, but there comes a time when routine methods will carry us no further. They then need to be supplemented by methods devised to meet the circumstances of the case before us; of the area in which we desire to progress. This is just as true of Mauritius as it is of other parts of the tropical world; perhaps, on account of the remarkable diversity of climatic and physiographical conditions encountered locally, even more so than of most places. A survey of what was known locally about malaria was therefore undertaken and from the data so collected the broad lines of policy were formulated.

The situation at this time was that a number of major works executed under the Ross scheme in various parts of the Colony were

being "maintained" by the employment of gangs of men to restore the canalization of watercourses damaged by cyclonic storms, to keep streams free of weeds which might impede the flow of the water, and to keep channels which had been cut through rock free from the rubble carried into them by floods. Owing to the nature of these works, to the fact that many of them had deteriorated to such an extent as to have completely lost their effectiveness, and to the continual exposure of the Colony to cyclonic storms and their attendant destruction of most surface drainage works, maintenance was a very heavy charge on the colonial budget, while the value of the works themselves was by no means commensurate with the expenditure, either because of deterioration or because extensive minor nuisances on private property, or in the neighbourhood of the works themselves, completely nullified whatever beneficial effect they may originally have exerted. A survey of all these works was therefore made and their value carefully assessed, so far as one could, those which were considered to be now valueless were abandoned, the maintenance of those selected for preservation was reorganized and put upon a more efficient footing. Since most of these works were in the coastal area this policy harmonized with the general policy laid down.

Malaria at the Present Day.

In formulating the general policy consideration was given to the increase in our knowledge of the disease which has taken place in recent years and has been ably summarized in two publications of the League of Nations (1927, 1933). The local information was scrutinized in the light of this knowledge and the following broad principles formulated.

Malaria in the Colony can be regarded as occurring in three regions, in each of which conditions are fairly uniform and characteristic. Those regions are (1) the town of Port Louis and its environs, (2) the coastal lowlands, and (3) the central elevated plateau.

(1) *Port Louis*—The town of Port Louis lies on the floor of a bowl-like formation of country, half the circumference of which has disappeared into the sea; the remaining rim of the bowl forms a magnificent and picturesque amphitheatre of rugged hills with precipitous sides intersected by two main cuttings, the Vallee Pitot, and the Tranquebar. The bottom of this formation is now roughly elliptical in shape, the long axis being some three or four miles in length, while the short is about a mile and a-half. The long axis runs more or less parallel with the coast. This area is fairly flat, having a gentle rise from the coast to the foot of the surrounding hills. The soil is largely composed of rubble, gravel and boulders, with a few marshy areas here and there. Numerous springs find their outlet in this area, which is intersected by several streams finding their way from the hills to the sea.

The town itself is the only seaport of the Colony. It is roughly kidney-shaped, its long axis coincident with the long axis of the site and the most congested portion is the half nearest the harbour. As the town proceeds inland congestion gives place to spaciousness, until one reaches the inland municipal boundary at which one is in that peculiarly drab no-man's-land which is so characteristic a feature of many tropical towns where the occupied parts give place to open country. The town was planned by LABOURDONNAIS on the rectangular system and it has been well laid out. Before the great malaria epidemic it was a bustling place, harbouring an energetic and vigorous community

and in frequent touch with the outer world. The cumulative effects of the advent of the steamship and the opening of the Suez Canal have deprived it of its strategical importance both from a military and a commercial point of view, while the exodus of the wealthier classes of population to the interior following upon the malaria epidemic, the hurricane of 1892 and, later, the plague, have lowered its rateable value to a very great extent. It is now only inhabited by the poorer classes and by one or two professional men whose work entails residence there.

In 1931 the census population of the town itself, as apart from the district which bears its name, was a little over 47,000 persons, males and females in almost equal proportion. Of these, 20,251 were of Indian race; 4,142 were Chinese, and the remainder, 22,669, were classed as the "General Population." The general economic level of this population is low, its hygienic practice rudimentary and its death-rate commensurately high.

The town is governed by an elected Municipality, which, however, in 1921, had its powers drastically curtailed when important municipal services such as the maintenance of roads, sanitary services and water supply were taken over by the Government and entrusted to the Public Works and the Medical and Health Departments.

The town presents two important and striking features in relation to malaria, one due to human agency, the other arising out of its situation. It is difficult to appraise the effect of each of these on the malarial situation. The first factor mentioned is the municipal water supply. This is designed to supply the population with some 5,000,000 gallons of water a day, an average daily consumption of over 100 gallons per head. There are no large water-consuming industries in the capital and this phenomenal figure represents the domestic consumption of the town. It is clear that three-quarters of this water must run to waste; and this is so. Wastage occurs frequently from leaky pipes; and largely from the entire lack of water discipline in the population who have never, by means of meters, been obliged to pay for what they waste. The result is that in the more sparsely occupied areas of the town there continually recur water nuisances which are extremely difficult to control with a limited staff.

The other important malarial feature is inherent in the site. The semicircular range of hills flanking Port Louis on its southern aspect constitutes a catchment area whose only outlet is through the town itself. In dry weather the valleys on the inland side of the town are scarred with numerous stream beds in which there is no water to be seen; or whose course may be marked by a succession of pools. Where those streams traverse the municipal area on their way to the sea they have been canalized and in part confined in fine old masonry channels which have served their purpose well. During the greater part of the year there is little water running through them. But a heavy and prolonged shower of rain changes all this. The dry stream beds become torrents tearing their way down the hill sides, excavating new courses and carrying with them trees, branches, boulders and rubble in large quantities. The force of such torrents is sufficient to tear up whole sections of canalization even within the municipal limits and to obstruct the outlets of the streams with tons of gravel, boulders and other miscellaneous rubbish, causing flooding in the town itself and further up the stream. During the cyclone season such floods are always likely to happen, and a number of them in succession throughout the warm season means the creation of a vast area suited to the

breeding of *A. costalis*, the common malaria vector. It is little wonder that the resources of the Colony have been unable to cope with the Sisyphean task of "training" these streams and watercourses.

The dangerous anopheline nuisances resulting from floods arise at or just within the municipal limits rather than outside them or in the congested parts of the town itself, and it is clear that the natural, as contrasted with the artificial, municipal anopheline nuisances cannot be economically controlled in the absence of means to control the flood waters. Attempts have been made in the past, by the construction of large circumvallatory drains on the hill sides, to control floods, and to divert part of the water, at any rate from the middle of the town itself. Successive floods, and the peculiarly friable nature of the soil, have so damaged these drains as to render them more of a liability than an asset. The only solution to the problem of malaria in Port Louis appears to be to regulate, by means of dams, the flood water coming down the valleys, converting the lower part of each valley into a small lake which will act as a buffer between the flood and the town and which will, by appropriate sluice gates, enable the water to be ultimately discharged in a controlled stream over a period of weeks or months. When this has been accomplished, the reconstruction of the intra-urban drains can be undertaken with some prospect of permanency, and their subsequent maintenance effected at an insignificant cost. But the cost of those major engineering works will be high, a fact which, at present at any rate, rules them completely out of consideration.

What is the next best thing?

When effective action on the anopheline is impracticable an attempt may be made on the plasmodium. Fortunately, Port Louis is well placed with regard to means for the treatment of the disease. A number of medical practitioners reside in the town and their numbers are augmented by several who maintain consulting rooms there, though non-resident. There are many druggists' shops. There is the Civil Hospital with an out-patient department at which free consultations are given daily, and there are two Government Dispensaries for the same purpose. The Government Poor Law Department also maintains a part-time medical officer for the examination of persons applying for relief on grounds of ill health or bodily infirmity.

In addition to these professional agencies there are always to be found a sufficient number of public-spirited citizens who are prepared to keep on their premises a stock of totaquina tablets which are distributed gratis to those suffering from fever. This organization was inaugurated by the Mayor during a sharp outbreak of malaria in 1930 and successive mayors have continued the arrangements in each subsequent malaria season.

The town cleansing branch of the Health Department under the Government Medical Officer of Health for Port Louis has hitherto endeavoured to keep free of obstruction all the masonry drains passing through the town. Financial stringency has greatly handicapped the work but the drains have been kept clear for the most part, though they are frequently obstructed for a longer period than is desirable. The oiling of certain notorious pools and the filling of others situated on the outskirts of the town go on throughout the year.

It is clear, however, that such palliative measures cannot effect any cumulative improvement. The only radical measure in the catalogue is the treatment of patients. But this, on account of the impossibility of persuading patients to take an adequate course of treatment, takes

merely a palliative form. Real improvement will come only after the regulation of the flood water, and the imposition of water discipline with regard to the domestic water supply, and the prospects of the adoption of either measure are remote. The present policy is, perforce, to work along palliative lines meanwhile, in the hope that at some future date the resources of the Colony will enable radical measures to be instituted.

(2) *Coastal Lowlands*.—Conditions in the coastal belt are fairly uniform. The climate is favourable to mosquito breeding throughout the year and the numbers of mosquitoes vary largely with the rainfall, or rather with the monthly number of rainy days. A succession of rainy days totalling perhaps only a couple of inches of rainfall will create a much greater mosquito nuisance than a single heavy down-pour of twice that amount. The population is scattered, though mainly distributed along the roads or resident on sugar estates; there are numerous tidal lagoons and marshes. A number of marshes are at or below sea level. Villages are few and not usually compact, the houses generally straggling along the road for some distance, there being little actual depth to the village itself.

In such regions the control of mosquito breeding throughout the area is quite impracticable with the means at our disposal. We can only hope to institute mosquito control in the close neighbourhood of places inhabited by such a number of persons as will bring the *per capita* cost of the measures within reasonable proportions. In the writer's opinion the policy one must adopt is to control malaria, not mosquitoes, and this may best be done by making totaquina, quinine and the accessory drugs available to every sufferer from the disease. Arrangements are made with rural shopkeepers to sell totaquina in tablet form at cost price.

Bonification cannot be carried out by bringing new areas of land under cultivation. Most of the available land is already producing its maximum quantity of the staple crop. Other crops have been tried from time to time but they have failed even to threaten the supremacy of the sugar cane, which is the only cyclone-resistant crop known to be suitable for local cultivation. Further, in the present state of the international sugar market, where most of this foodstuff is being sold below the cost of production, and when sugar-producing colonies are subsisting on what is practically an Imperial dole, bonification by means of increased remuneration of the labouring classes is quite impossible.

(3) *Central Plateau*.—In the central plateau we have an area admirably suited to mosquito control. Our great ally is the cool dry season which, even now, has a remarkably restrictive effect upon the distribution and numbers of anophelines. The density of population is high, and this factor, compared with the estimated cost of the construction and maintenance of major works brings the *per capita* cost of the measures well within the range of practical politics. It may be too much to hope for the eradication of anophelines from this area, but surveys have shown the practicability of bringing them under control.

Combined with these favourable circumstances we have a large resident population of European descent, and a large proportion of the total population in reasonably affluent circumstances and able financially to co-operate with the Government in mosquito control. The area is well provided with resident doctors in addition to having two Government hospitals and a number of Government dispensaries, so that, though no direct attack on the plasmodium is planned, the means

available for the treatment of patients encourage the belief that treatment plays a substantial part in this area. Government policy is accordingly directed towards mosquito control, and by this is meant, principally, anopheline control throughout the area which comprises practically the two districts Plaines Wilhems and Moka.

Malaria Organization

The Medical and Health Department of the Government is at present in the transition stage between its former organization and that recommended for future adoption. In the future, however, anti-malaria work will be entrusted to a special branch of the Health Department, staffed by three medical officers, an entomologist, clerk, and the requisite number of subordinate workers. This branch will be responsible for the continuous study of malaria in the Colony in all its aspects, and it will initiate, construct and maintain all anti-malarial major works for which the Government is responsible in the central plateau, and in such parts of the rural districts as do not fall within the areas of the Health Centres. Health Centre areas will be in charge of the district health officers, who are responsible for all medical and sanitary matters within the Health Centre areas, which will be so delimited as to include all important collections of dwellings in the districts.

Financial stringency has led to the malaria staff, or at least the professional members of it, being also entrusted with the hookworm campaign, but, as the hookworm work is carried out in the early morning, the two campaigns are not so incompatible as would appear at first sight, and, so far, the combination has worked well. There is no reason why it should not continue to do so.

The nucleus of this branch, a medical officer, entomologist, secretary, microscopist, and about 140 regularly employed subordinates and a variable number of labourers, has already operated since 1927. Much valuable survey work has been done, and a number of important drainage works executed by the sanitary engineer working in close co-operation with the branch. Its activities have been practically confined to the so-called MACGREGOR zone in which the fully staffed branch will carry out most of its executive work for some years to come.

The plan of campaign laid down has been to select two points in the zone (one at the town of Curepipe; the other at some little distance to the west of the township of Quatre Bornes); to survey a roughly circular area of about half a mile radius round each; to eliminate all serious permanent anopheline breeding-places in these areas, and to keep under surveillance and control all collections of water likely to become temporary breeding-places. When the area of half mile radius has been thoroughly dealt with, the radius is extended by again half a mile, and so on until eventually the contiguous circumferences fuse and the whole area has been treated. The completion of this work will be sufficient to keep the branch fully occupied for a number of years, and in this connexion it should be noted that previous estimates of the duration of malarial campaigns in the Colony have greatly underestimated the time factor. Even were funds available, which at present they are not, there would not be sufficient labour to enable the works to be carried out in one or two cool seasons. In spite of its densely populated state the Colony experiences, paradoxically enough, labour shortage at harvest time when every available labourer is required for the crop. No Government could at that time justify the diversion of labour from the estates, even for sanitary works of some importance,

to the extent apparently envisaged or possibly overlooked by previous writers on this subject.

The staff of the Malaria-Hookworm Branch will be vested with the powers of the Sanitary Authority to enable them to ensure compliance of the sanitary law and regulations so far as these are applicable to their work

Legislation

The main legislation dealing with malaria is contained in the Public Health Ordinance 1925. Part VII of this Ordinance enacts that occupiers or, in their absence, owners shall keep their premises free of articles capable of holding water liable to breed mosquitoes; in the same section it is enacted that wells, watering basins, tanks, and other vessels meant for the storage of water on premises, shall be effectually screened. After the responsible party has been once warned, the subsequent presence of mosquito larvae on the premises constitutes an offence in respect to each collection of water and renders him liable to a fine not exceeding Rs 100. Provision is also made whereby the Sanitary Authority may take immediate steps for the destruction of larvae so found.

In the section of the Ordinance entitled "Miscellaneous," power is given to the Governor in Executive Council to direct the execution of works anywhere in the Colony for the purpose of effecting sanitary improvements. Amongst the measures which may be so executed are the drainage of marshes or other low-lying grounds where water may accumulate and such modifications of stream beds as will abate the nuisances so caused. Works of this kind required on Crown lands are to be executed by the Government, and on private lands by the Government or the owners. Provision is made for the assessment of the cost of such works and the proportionate chargeability of the beneficiaries. The cost of maintenance of the works is also apportioned among the beneficiaries, according to the provisions of the Ordinance.

An old Ordinance, 13 of 1875, originally intended to make better provision for the conservation of the woods and forests of the Colony and to protect the watercourses, has since been found to be a useful instrument for the prevention of the breeding of *A. costalis* in rivers and streams. In its modern form it enacts that there shall be a strip of wooded land bordering upon all rivers and streams and that trees growing thereon shall not be cut without the permission of a Board known as the River Reserves Board, in whose jurisdiction all such matters fall. The strip of wooded land varies in depth according to the class of watercourse it borders, the depth of the strip being 50 feet on either edge of a river, 25 feet for a rivulet and 10 feet for a feeder. Those strips of land are known as River Reserves. The history of the River Reserves shows that they have been assailed more than once on sanitary grounds, but the discovery that *A. costalis* larvae were exceedingly rare in streams whose waters were shaded by the trees growing in the Reserves and that destruction of the Reserves was followed by the appearance of these larvae in the corresponding part of the stream, established them firmly as assets in the sanitary balance sheet of the Colony. The Reserves were entrusted to the Board mentioned above consisting of the Medical Director, the Conservator of Forests, and, recently, the Inspector General of Police, and it is now the policy of the Board to maintain these reserves fully planted up.

One would think that the anti-mosquito provisions of the Public Health Ordinance would give the Medical and Health Department

enough power to cause the abolition of all minor nuisances on private premises. That minor nuisances in large numbers still exist is scarcely the fault of the Legislature or of the Health Department. The success of any legislative measure depends upon a number of factors, among which we may include approximately in the order of their importance, its practicability, the civic sense of the population, and the general habits of the people. Other conditions are the general economic state of the population as a whole and the means at the disposal of the Government for ensuring the enforcement of the law. In practically every one of these essential factors we find a lamentable deficiency of the elements which ensure an effective anti-malarial campaign. It is impossible in a communication of this kind, which must necessarily be brief in relation to the subject, to analyse the various factors concerned. But it is apparent that a legislative measure can succeed only when it commands the active co-operation of the majority of the people and this particular section of the Public Health Ordinance has hitherto failed to do so. Nevertheless, active steps are being taken to bring within its provisions the elevated plateau, where the majority of the minor anopheline nuisances occur, and are allowed to persist, on private premises. Freedom from malaria in this region of the Colony depends entirely upon the cumulative effect of the action taken by each person to keep his premises mosquito-free; by no means an impossible or arduous task, and the efforts of the Anti-Malaria Branch of the Department will be directed towards hammering this important fact home in all concerned.

Vital Statistics.

The reader will have doubtless remarked by this time the absence of any detailed reference to statistics relating to malaria in the Colony. The means at our disposal for the collection of accurate statistics are quite inadequate, and the absence of accurate statistical data is a serious handicap to the work. Taking the records in general, it may be said that the actual death rates and birth rates are accurate. Where inaccuracy creeps in is in statements of the causes of death. The main statistical grouping of the causes of death gives a fairly accurate picture of the proportionate incidence of groups in the death returns, but when one proceeds beyond the group one ventures into the realm of surmise. Some twelve years' experience of the Colony leads me to believe that malaria is recorded as a cause of death much more frequently than is actually the case, and that the numbers of patients attending the dispensaries on account of malaria are exaggerated. There is a tendency to regard each new patient suffering from a febrile illness as a case of malaria. The early cases of an outbreak of influenza in a locality have been recorded as malaria, and there is no doubt that the returns are exaggerated in this way. The general tendency is to overstate malaria and understate the diseases in which the early symptoms may be confused with it.

In the absence of accurate statistics regarding the disease itself the only index of endemicity left is the splenic index and it is this which will be adopted as the standard, though special enquiries regarding malarial morbidity and the incidence of deaths from malaria on age and sex groups will be made in selected areas.

Plasmodia.—The common cause of malaria in the Colony is *P. vivax*, *P. falciparum* is also fairly common, but *P. malariae* is rare and is confined to certain localities. A. R. D. ADAMS has recently discovered *P. tenue* but it is extremely rare.

Outlook

The prospects of the control of malaria in the Colony differ according to the three regions already described. The prospect of effective control generally throughout the coastal region is very remote; and it appears that the disease will remain endemic there for many years to come. In Port Louis the control of flood water and the regulation of the use of domestic water would go a long way to reduce the disease to insignificant proportions. But this will largely depend upon the possibility of constructing the necessary major works, which depend entirely upon the financial prospects of the Colony. On the central plateau the control of malaria is possible, but only with the effective co-operation of the public. This is so true that the quantity of malaria in this region can be regarded as a fairly good index of the sanitary practice and intelligence of the inhabitants. If they are determined to control the disease, the power is theirs and theirs alone. It is by no means an impossible task. And in this area Ross's dictum "minor works before major works" requires constantly to be kept in mind. Unless the dictum is adopted as the policy of the Government, there is always the danger that occasion will be given for the old complaint that in spite of the vast sums spent by the Government to date on major works the morbidity from malaria in this region is practically unaffected.

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LEPROSY.

INTERNATIONAL JOURNAL OF LEPROSY Manila 1933 Apr. Vol 1. No. 2. pp. 129-264, July. No. 3. pp 265-392, Oct. No 4. pp. 393-512.

The following information on the distribution and epidemiology of leprosy in various countries is reported in Vol 1, nos. 2, 3 and 4 of the *International Journal of Leprosy*.

i. Leprosy in Finland [CEDERCREUTZ (Axel)]. pp 195-199. With 4 figs.

1. In Finland careful censuses show an increase in the lepers from 52 in 1893 to 95 in 1904, but a subsequent decrease to 34 in 1931, 16 of whom are in a leprosarium. The average age has increased from 45 to 59.4 years and the nodular cases have decreased from 68.7 to 27.4, so the disease is tending to die out, but in the seven years since 1924, 11 nodular and 11 nerve cases have been found, nearly all in the south-west. Voluntary isolation is advised.

ii. Leprosy in Estonia and Latvia [PALDROCK (A)]. pp. 201-204. With 1 map.

1. In Estonia a questionnaire revealed 242, or 0.21 per mille, lepers in Estonia, of whom 195 are in institutions and 47 under control in their homes under a compulsory isolation law. Some cases have been released as "cured" after two years negative bacteriological tests.

In Latvia 207 cases, about 0.11 per mille, are known, and 174 are isolated in an institution and 33 in their own homes. Complete "cures" have been obtained with X-ray treatment. No information could be obtained from Lithuania.

iii. Statistics of Leprosy in the Krutyje Rutschji Leprosarium, Leningrad [STEIN (A. A.) & KARPICHINA (Anna)]. pp. 309-320.

1. This paper records an analysis of 637 lepers in one of the oldest Russian leprosaria founded in 1894 at Krutyje, Leningrad. Of these 60 per cent. were males; 57 per cent. were nodular, 21.4 per cent. nerve and 21.6 per cent. mixed cases, with a tendency to an increase in the proportion of nerve cases indicating a decline in severity. Only 35.4 per cent. were from 0 to 20 years of age, and 53.3 per cent. admitted contact with lepers, mostly relations. The primary lesion was recorded in 88.3 per cent., and the duration before admission was 12 to 15 years owing to early cases being hidden.

iv. Leprosy in St. Croix. A Study of the Inmates of the Leper Asylum [Fox (Howard)]. pp. 321-328. With 3 figs. on 1 plate.

1. This is a report of a visit by Dr. H. Fox of New York to the small island of St. Croix in the West Indies Virgin Islands group, where 106 lepers had been found by EHLERS in 1902; now 82 are in an asylum, mostly females, with an average duration of the disease of 14.6 years and a preponderance of nerve cases.

v. Summary of the First Leprosy Census in the Republic of Mexico [URUEÑA (Jesus Gonzalez)]. pp. 329-336. With 1 fig.

1. In Mexico a questionnaire elicited answers from only about half the doctors, and from only 19 per cent. of the townships, so the total of

1,450 lepers reported must be much below the true number. The age of onset: persons up to 19 comprised 22 per cent of the cases, most were in males, 59 per cent were nodular, and over half admitted possible contagion. Some of the principal centres were hot coastal areas

vi The Incidence and Treatment of Leprosy in British Guiana and the British West Indies [ROSE (F. G.) pp. 337-340

vi The incidence of leprosy in British Guiana and the West Indies is dealt with by F. G. Rose, whose work in organizing the modern methods of prophylaxis and the treatment of early cases at clinics in British Guiana has been recorded in previous issues of this *Bulletin*. Taking only cases in institutions so as to be comparable, he finds that the official records show an average incidence in the more affected larger West Indian Islands of 0.5 per mille, but varying from 2.3 per mille in the small island of St. Kitts down to only 0.1 per mille in Jamaica, where there are very few children in the asylum and the numbers known are evidently far below the real total. The same is doubtless true to a less extent of all the areas outside British Guiana in the absence of facilities and legal sanction for early cases to be treated at clinics without isolation.

vii Notes on the Work of the United States National Leper Home [DENNEY (O. E.) pp. 399-406

vii. This paper is an abstract of the annual report of the U.S.A. Carville National Leper home with a capacity for 356 patients, which was fully occupied. The admission of 80 patients, 61 of them new ones, was the highest known, and as usual the majority came from the Gulf States. The deaths were 20, or 56 per mille. Chaulmoogra esters are being less used, but Fowler's arsenical solution orally has become more popular and is considered beneficial. The special skin, neuro-psychiatric, orthopaedic, dental, laboratory and X-ray services under specialists have been maintained, and diminishing discontent among the patients is reported.

viii La lèpre en Afrique Occidentale Française. Etude bibliographique [ROBINEAU (M.)]. [Leprosy in French West Africa.] pp 459-462 [10 refs.]

viii. The incidence of leprosy in French West Africa is dealt with by M. Robineau in a summary of the recorded data, which shows a very extensive prevalence which is serious in some areas. Thus in Ivory coast villages the rates vary from 36 to 211 per mille, on the Upper Niger the rate is 33 per mille with a total of several thousand cases both there and in Dahomey. A prophylactic leprosy service has recently been organized for these French territories.

ix. Leprosy in Canada [HEAGERTY (J. J.) pp. 463-468.

ix. Leprosy in Canada is dealt with by J. J. Heagerty, who recalls the first discovery of the disease in 1815 and the opening of the Tracadie leprosarium in 1844 for Western Canada, which has since cared for some 150 cases; it was rebuilt and modernized in 1896, and now has 9 cases, 4 of which are arrested. In British Columbia there is an island lazaretto for imported cases with 5 Chinese male lepers in 1932. As no new cases have appeared in New Brunswick since 1919 the disease appears to be dying out there.

L. Rogers.

LEPROSY REVIEW. 1934. Apr. Vol. 5. No 2. pp 51-98. With 9 figs. on 2 plates. Quarterly Publication of the British Empire Leprosy Relief Association, 29 Dorset Square, London, N.W.1.

This number contains the concluding portion and the recommendations in Dr. R. G. COCHRANE's report on leprosy in Ceylon. He advises modification of the Leprosy Ordinances to make segregation less rigid, further surveys, propaganda and the treatment of early active cases with isolation of infective cases on the lines of recent work in India. The present compulsory powers should be retained for the present to enable refractory infective cases to be dealt with.

Surgical problems are dealt with by A. ROY, who advocates more free removal of dead bone to allow trophic ulcers to heal, amputation in some crippled cases, and operative measures to give lasting relief in cases of ectropion.

Antimony treatment is once more advocated by F. G. CAWSTON, although he does not report any further personal experience of it, but mentions that it was given up after full trial in the Zululand leprosarium.

The first part of a short history of the foundation a decade ago of the British Empire Leprosy Relief Association is recorded by L. ROGERS. L. R.

LEPROSY IN INDIA. 1934. Jan. & Apr. Vol 6. Nos. 1 & 2. pp. 1-68; 69-126. With 1 fig. & 1 chart. Issued quarterly by the Indian Council of the British Empire Leprosy Relief Association.

The following are the more important articles in the January issue

G. RYRIE writes on the incidence of leprosy among the S. Indian and Chinese races in the Malay States, and notes that the former suffer more from the milder nerve types and the latter from the more severe dermal forms, in spite of the Indians living on a less nourishing diet. GLASS and RISHI have examined the bone marrow, either post-mortem or in excised necrosed bone, in 69 cases and found lepra bacilli in 17 out of 21 mixed cases but in none of 48 nerve cases.

E. MUIR and S. P. CHATTERJI report favourable results in leprosy eye lesions with trypan blue injections in the form of 0.1 per cent. solution in normal saline injected subconjunctivally, or in a 1 per cent. solution intravenously once or twice a week in doses of from 3 up to 20 cc., freshly prepared solutions of Grubler's preparation being advised. Brief notes of 11 cases show uniform partial or complete relief of pain and improvement of vision.

E. MUIR discusses factors influencing the nature of leprosy lesions, and Mrs. TODD records the remarkable success of a Leper day in raising over £2,500 in the Salem district of Madras. Further papers read at the Calcutta March 1933 Conference are printed, but contain nothing new.

In the April number E. MUIR suggests additions to descriptive nomenclature adopted by the Leonard Wood Memorial Leprosy Conference to enable estimates to be made of the degree of resistance of the patient, the skin area affected, the bacillary concentration, etc., nearly all requiring laboratory tests and so applicable to research institutes in enabling the effects of treatment to be more accurately gauged. J. LOWE has obtained little effect on preparations of *M. leprae muris* in vitro by chaulmoogra and hydnocarpus preparations

on the lines of WALKER and SWEENEY's work on acid-fast organisms, but he points out that such observations do not prove that it has no effect in vivo.

L. R.

SIMONS (L. H.). De lepra op het eiland Ambon. (Een bijdrage tot de kennis omtrent het besmettelijkheidsvraagstuk der lepra.) [Leprosy on the Island of Ambon. The Question of its Infectivity.] —*Meded. Dienst d. Volksgezondheid in Nederl.-Indië*. 1933 Vol. 22. No. 4. pp. 197-208. With 2 maps on 1 folding plate.

The island of Ambon (Molucca group) is peculiarly suitable for the study of leprosy owing to its common occurrence there. It is the author's contention that the closeness of contact which exists among the inhabitants with, in many cases, a remarkable freedom from leprosy is not favourable to the view of direct infection. He favours the idea of a leprosy predisposition, which is inherited.

A number of facts are set out in support of this point of view. The leper in Ambon is not debarred from mingling with the rest of the population. He may be a washerman, he may play football with his fellows and he may be either foreman or workman in his regular occupation. The disease is strikingly incident in certain families and might in certain places be called a family disease. Among the requirements put forward for transmission of leprosy by infection are the necessity for long duration of contact and special intimacy. And yet an investigation of 157 marriages, where one or both parties were leprosy, showed that 19 had been both affected before marriage and only two could be regarded as having contracted leprosy after marriage. The rarity of occurrence of infection through marriage and the frequency of occurrence in definite families are best explainable, according to the author, by a theory of inherited congenital disposition. He gives an interesting frequency distribution of the appearance of leprosy at years 1-5, 6-10, 11-15, 16-20, 21-25, 26-30, 31-35, 36-40, 41-45, 46-50, 51-55 and over 55 in the numbers 5, 32, 49, 53, 61, 21, 26, 19, 9, 12, 8 and 7 respectively. Leprosy has a peculiar area distribution in regard to its very high degree of occurrence in Leitimor and its low degree in Hitoe. These two portions of the island are connected only by an exceedingly narrow peninsula. The former area is inhabited mainly by Christians and the latter by Mohammedans so that it seems probable that this marked difference is based on some distinctive habit or mode of life. The fish theory of leprosy is only mentioned to be dismissed and the rôle of the rat is suggested for further investigation.

W. F. Harvey.

SMART (A. G. H.). The State Control of Leprosy.—*Malayan Med. J.* 1933. Dec. Vol. 8. No. 4. pp. 211-218.

The author, who is the Senior Medical and Health Officer, Selangor, first gives interesting historical information regarding legislation in Malaya for the control of leprosy and points out that up to recently segregated lepers could only be released on a medical officer's certificate that the patient was "cured," which was very rarely given. He next discusses antileprosy measures in other countries, with the frequent adoption of the more modern methods of control which are known to readers of this *Bulletin*. In Malaya there are now just over 3,000 lepers undergoing institutional treatment, a death rate up to 1911 of 26 to 30

per cent has been reduced to 8.4 per cent, and there has been an increase in the notifications with improved conditions and treatment. Since 1929 the policy of attracting lepers to come early "with treatment at special clinics without being arrested and confined" has been approved by the Principal Medical Officer, F.M.S., and discharges of uninfected cases have commenced: a Discharged Leper's Aid Society is advocated for them. Children born to lepers are removed from their parents within 14 days and no case of leprosy is known to have occurred among them. He concludes that the goodwill and confidence of the lepers is being won by these modern methods and "the amazing change that has come about in the care of lepers makes us optimistic for the future."

L. R.

RYRIE (Gordon A.). **Some Difficulties in Leprosy.**—*Malayan Med. J.* 1933. Dec. Vol. 8. No. 4. pp. 238-243.

This is a paper read at a Malaya medical meeting containing general information on the diagnosis, prognosis and treatment of the disease. The author regards the adoption of the intradermal injection of ethyl esters as the most important recent advance. He rightly regards leprophobia as more infectious and harmful than leprosy itself since it leads to the hiding of cases.

L. R.

SHARP (Leonard E. S.); DOWNES-SHAW (Alma) I. "Leprosy in Uganda." 2. "Observations on Leprosy in Teso."—*East African Med. J.* 1934. Jan. Vol. 10. No. 10. pp. 301-307.

In the first of these notes L. E. S. Sharp describes once more the Kigezi Leper Colony in Eastern Uganda, where model villages have been constructed in an isolated area around an administrative centre with a hospital, and with land to cultivate. Families with lepers are taken in and kept under close observation, while schooling is provided for the children. The colony was opened early in 1931 with 25 lepers and by July 1933 they had increased to 380, about one-third of whom were children. Only a portion of them were treated and the rest served as controls, with the result that he has come to the conclusion that the better conditions of life were more effective than drugs in bringing about the improvement or arrest of the disease in more than half the total cases.

In the second note Dr. Downes-Shaw estimates the lepers in Tezo at at least 3,000, of whom 600 have been seen. A hospital for children and out-patient clinics have proved to be of value, but a camp for advanced cases has been replaced with advantage by a colony on the lines advocated above by Dr. Sharp.

L. R.

ATKEY (O. F. H.). La fréquence de la lèpre dans le Soudan en relation avec le climat et le régime alimentaire. [**Leprosy in Sudan in Relation to Climate and Diet.**]—*Bull. Office Internat. d'Hyg. Publique.* 1934. Mar. Vol. 26. No. 3. pp. 490-496.

This is an interesting account of the infrequency of leprosy in north and central Egypt, especially among the Arabs possessing goats and other animals living largely on milk, and its much greater frequency among the negroes without these advantages in both the central and southern areas including the Anglo-Egyptian Sudan. The climate and rainfall will not explain the differences.

L. R.

VAN CAMPENHOUT (E) La lutte contre la lèpre au Congo Belge. [Measures against Leprosy in Belgian Congo.]—*Bull. Office Internat. d'Hyg. Publique*. 1934. Mar. Vol. 26. No. 3 pp. 497-498

Leprosy is widespread in the hot humid Belgian Congo, and especially in the Nepoko region. The Red Cross Society has developed the work of prophylaxis by erecting 6 hospitals, 28 dispensaries and 2 homes for leper mothers. Antileproous centres consist of three agricultural villages, with land to cultivate to render them largely self-supporting, and placed about six miles apart with good communications to allow of modern methods of medical care under a sanitary agent and a medical officer. During the last seven years surveys have revealed 4,600 lepers in a population of 443,700, or a little over 10 per mille. The extension of the system of getting as many lepers as possible into the leper village settlements appears to be the most promising way of dealing with the problem. L. R.

LEGER (Marcel). La lèpre dans nos colonies tropicales d'Amérique. [Leprosy in the French Colonies of America.]—*Rev. Prat. Malad. des Pays Chauds*. 1934. Feb. 13th Year. Vol. 14. No. 2. pp. 637-644, 647-652, 655-656, 659.

A brief history of leprosy and leprosaria in French Guiana, Guadeloupe and Martinique is first given, in the light of which prophylaxis is considered. The author points out that two centuries of compulsory segregation has failed even to prevent the slow increase of the disease, but that much milder measures succeeded in Norway. He therefore advocates the adoption of the modern methods of treating cases in their early stages in a number of local dispensaries, and the medical inspection of schools, together with compulsory notification by the doctors with strict guarding of professional secrecy, in place of iniquitous and arbitrary measures based on disguised segregation. L. R.

GRIZAUD. Quelques réflexions sur une léproserie de l'Atlantique : (La Désirade Guadeloupe). [A Leprosarium in the Atlantic : Desirade.]—*Ann. de Méd. et de Pharm. Colon.* 1933. Oct.-Nov.-Dec. Vol. 31. No. 4. pp. 551-558.

A description of the situation and bad conditions of the Desirade leper Island, Guadeloupe, an arid, waterless spot, is given, and the patient work by means of which the confidence of the unfortunate patients was obtained. Some degree of amelioration through treatment is described. The lepers here isolated compulsorily number 70, 52 of whom are now being treated regularly. L. R.

LAMPE (P. H. J.). Voordrachten over de endemiologie der lepra. [Lectures on the Endemiology of Leprosy. I. Historical Survey.]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1934. Mar. 13. Vol. 74. No. 6. pp. 332-338. English summary.

Leprosy in a historical and therefore endemiological sense is as old as the world. Its endemiology has manifested changes with the changes of medical opinion and certain important events or discoveries serve to mark off the periods of these changes. The first period extends from the beginnings of history up to 1850 and may be described as a

time of confusion with other diseases and of a popular belief in its infectivity. During this time leprosy or elephantiasis graecorum was confused with elephantiasis arabum (filariasis), syphilis, yaws and skin affections such as the ringworms. During the second period, 1850–1875, dominated by the standard work of DANIELLSEN and BOECK, which appeared as a French translation in 1848, the doctrine of hereditary transmission of leprosy was in vogue. This was subscribed to by a British commission in 1862. One of the main arguments against the earliest view of the infectivity of leprosy was the absence of conjugal transmission. It was also contended that the majority of sufferers from leprosy were to be found in leper families, averaging 70 per cent. The theory of infectivity, however, still found expression in this period, although the great pathologist VIRCHOW contended for an unknown etiology. The third period 1875–1900 was one of important and definite change. In 1871 HANSEN discovered the leprosy bacillus 10 years before the discovery of the tubercle bacillus by KOCH. A second British commission in 1875 now declared unanimously for the infectivity of leprosy and this was also the pronouncement of the first international leprosy conference in Berlin in 1897. Two other periods may be marked off in this survey of the history of leprosy. The fourth period, which lasted from 1900 to 1930, saw the infective theory generally adopted, diversion of studies to the treatment of leprosy, conferences on leprosy and the foundation of the Leprosy Commission of the League of Nations. During this period there arose the idea that, to the extent to which individual cure is more difficult of attainment, to that extent prevention becomes more worth while. A short fifth period is given by the author as commencing in the previous period and extending to the present day in which there has been renewal of the study of endemiology, a study of the factors concerned in active transmission and of “the conditions which produce the disposition to development of manifest leprosy.”

W. F. Harvey

LANPÉ (P. H. J.). Voordrachten over de endemiologie der lepra. [The Endemiology of Leprosy.]—*Geneesk. Tijdschr. v. Nederl-Indie* 1934. Mar. 27. Vol. 74. No. 7. pp. 415–422. English summary

The author discusses the differences of opinion regarding the virus of leprosy, and whether the acid-fast bacillus or an ultra-virus or granule phase is the infective agent, but he does not come to any conclusion.

L. R.

KEIL (E. C.). The Importance of Nutrition in the Prevention and Cure of Leprosy.—*Internat. Jl. Leprosy*. Manila. 1933. Oct. Vol. 1. No. 4. pp. 393–398. With 3 figs. on 1 plate.

The author recalls that as early as the 17th century Dutch physicians in Surinam held that there is a causal relationship between diet and leprosy and this belief still survives there. A good nutritious diet is of especial importance in childhood when leprosy is so often contracted. In Surinam and other tropical climates the diet is essentially one of polished rice with a little salted meat or fish, but it should be rich in vitamins, certain mineral salts, and fats with a limited amount of carbohydrates. He therefore advises nutritional care to allow of lasting results in the treatment of leprosy, but does not record any experience of its use.

L. R.

JEANSELME (E.). Des connaissances acquises en léprologie depuis le milieu du siècle dernier. [The Knowledge acquired on Leprosy since the Middle of the Last Century.]—*Rev. d'Hyg. et de Méd. Préventive*. 1934 May. Vol. 56. No 5. pp. 321-331.

This is an interesting historical paper which is itself a summary so cannot well be abstracted. The distinguished author takes the opportunity to draw attention to his recently published monumental work on leprosy.

L. R.

MOLESWORTH (E. H.) **The Influence of Natural Selection on the Incidence of Leprosy.**—*Internat. J. Leprosy*. Manila. 1933. July. Vol. 1. No. 3. pp. 265-282. [22 refs.]

The following is the author's summary of his conclusions on this theoretical subject.—

"1. By appeal to the laws of natural selection and application of the herd experiments of Topley and Wilson it has been shown that natural resistance is necessarily raised by leprosy through the elimination of the great majority of susceptibles in an infected race.

"2. The behavior of leprosy in this respect has been shown to be analogous to that of other diseases, like measles and tuberculosis.

"3. It has been shown that natural resistance supplies an explanation for otherwise anomalous events in the history of leprosy, events that cannot be explained satisfactorily by any other hypothesis unless it be admitted that natural selection is also in operation.

"4. Natural selection was probably the dominating influence in determining the present freedom of Europe from leprosy." L. R.

MONTAÑÉS (P.) & NEGRO (E.). Primer síntoma objetivo en los leprosos españoles. [The First Objective Symptom of Leprosy.]—*Rev. San. e Hg. Pública*. 1934. Mar. Vol. 9 No 3. pp. 210-215.

This study of 417 lepers in Spain—about 25 per cent of the total—is of interest in that, in the slow march of the disease, the early symptoms are often forgotten. The authors go further than merely determining the first symptom, they are of opinion that the information obtained is of prognostic and therapeutic value.

They found that maculae were far the most common, occurring in 126 or 30.2 per cent. of the patients investigated, tubercles were next, but a considerable way below, in 67 or 16.0 per cent. These were first seen most commonly on the face and then, in order, the lower limb, upper limb and trunk.

Next commonest were neuritis, in 50 or 11.9 per cent., pemphigus 40 (9.5), most often on the legs, later on the arms. In no case did the pemphigus occur on the face and neuritis of the face was very rare. After these there followed rhinitis in 35 (8.5 per cent.) "acute" (*i.e.*, lepra reaction) in 22 (5.0), and loss of eyebrows in 17 (4.7). Other forms such as anaesthesia, oedema of legs and ulcers were very rare in their experience (from 3.1 to less than 1 per cent.).

Prognostically, the authors state that a beginning with maculae, tubercles, rhinitis, lepra reaction or loss of eyebrows indicates a severe cutaneous form, probably of shorter duration than the nervous variety and liable to painful intercurrent lesions. On the other hand early symptoms of neuritis, pemphigus, anaesthesiae, indicate the nerve type, and a milder disease, with little or no tendency to intercurrent affections and likely to have a course more prolonged.

Also, if the commencement is by rhinitis, loss of eyebrows, or the acute form great care must be exercised in treatment, as these are usually associated with bacilli in large numbers and their evolution is rapid. Those with early pemphigus and neuritis have fewer bacilli and are of slower evolution and exhibit a greater tolerance in treatment.

H H S

TISSEUIL (J.). Syndrome lépreux chez les malades contaminés à l'âge adulte [**Leprosy in Patients infected as Adults.**—*Bull. Soc. Path. Exot.* 1934. Mar. 14 Vol 27 No 3. pp 215-220. With 1 fig.]

The author records and comments on six adult males developing leprosy between the ages of 40 and 61 in French Guiana. The lesions were a few small unthickened patches, with some alterations in the sensation, of a pale-red lilac colour and becoming more evident on exposure for a time to the air, and he regards them as a mild modified form of the disease occurring in those infected late in life.

L. R

ISHIZU (Shun). Ueber Alopecia leprosa (Histologische Untersuchung) [**Leprous Alopecia: its Histology.**—*Japanese Jl. Dermat. & Urol.* 1933 Sept. Vol 34 No 3. [In Japanese pp. 261-320 With 35 text figs. & 35 figs (11 coloured) on 3 plates. [53 refs.] German summary pp 48-60.]

This paper records a minute description of the histology of leprous alopecia which should be read in the original by those interested in its subject

L. R

COLE (Howard Irving). **Chemistry of Leprosy Drugs.**—*Internat. Jl. Leprosy* Manila. 1933 Apr. Vol 1 No. 2 pp 159-194 [124 refs.]

This is the first of a series of comprehensive reviews of different aspects of the leprosy question to be published in the *International Journal of Leprosy*. It should be read by all interested in the subject as it deals with the literature from 1904 to date and includes 124 references. The Chaulmoogra group is first dealt with at length, and is followed by an account of the use of antimony, arsenic, copper and gold preparations, iodides, mercurial and other inorganic compounds, organic compounds and synthetic products.

L. R.

MUIR (Ernest). **Treatment of Leprosy. A Review.**—*Internat. Jl. Leprosy*. Manila. 1933. Oct. Vol. 1. No. 4. pp. 407-458. With 2 figs. & 2 plates. [257 refs.]

This is the second review of the series of an equally comprehensive nature, as it includes vaccines and serums, chaulmoogra and other oils, iodides, the heavy metals and a variety of other drugs, surgical and other local treatments. The factors modifying the disease, as lepra fever, are dealt with, and a valuable section is that on the evaluation of treatment in which the numerous sources of fallacy are pointed out. General, regional and operative treatment, and the control of patients during treatment and after discharge conclude a very valuable review by a master of his subject.

L. R.

EMERSON (G. A.) & SALLE (A. J.). **In Vitro Leprocidal Activity of Some Non-Chaulmoogryl Compounds.**—*Proc. Soc. Experim. Biol. & Med.* 1934 Jan Vol. 31. No. 4. pp. 428-433. [Refs. in footnotes]

The activity of over 200 compounds *in vitro* has been tested on a culture of "M. leprae hominis" isolated by E. L. WALKER in California in the medium of Long and Seibert. The first group was a series of dyes, and he mentions that trypan blue was ineffective, as were eosin and fluorescein. Mercurochrome had a high activity, but acriflavine little. The second group were metallic organic compounds and Hg, Sb, Au, Ag, and Cu organic compounds showed high activity. Pentavalent arsenical compounds were without effect, but arsphenamine is highly active. Iodides were only active in concentrations of 1 per cent. The third group were selected for properties which in the chaulmoogric acid derivatives have been held to cause the peculiar activity of the molecule, such as highly unsaturated compounds and those containing 16-18 carbon atoms and the results are shown in a table. The fourth group included fatty acids other than chaulmoogra; these are also tabulated. They are now testing the action of the more promising compounds experimentally in leprosy rats. L. R.

NOLASCO (J. O.). **Lymphatic Absorption of Iodized Ethyl Esters of Wightiana Oil by Intramuscular Injection.**—*Jl. Philippine Islands Med. Assoc.* 1933. Dec. Vol. 13. No. 12 pp. 552-557

In view of the previous demonstration that Hydnocarpus esters injected intradermally or subcutaneously can be demonstrated as yellow globules in tissues and lymphatic glands, the author has investigated in monkeys the absorption of the drugs, and he found that those injected intragluteally were present in the lumbar, but not in the inguinal glands, and those inserted into the deltoid and triceps muscles only reached a portion of the axillary glands. As leprosy bacilli may be found in various lymphatic glands he advocates a much wider distribution of the injections so as to obtain absorption of the drug through as many as possible of the glands of the body. L. R.

ANDRÉ (Z.) & LABERNADIE (V.). **Essais de traitement de la lèpre et de la tuberculose par des injections intraveineuses d'huile de chaulmoogra.** (2e note). [Treatment of Lepers by Intravenous Injections of Chaulmoogra Oil.]—*Bull. Soc. Path. Exot.* 1933. Dec. 13. Vol. 26. No. 10. pp. 1234-1235.

In this brief note the authors report having given 595 intravenous injections of *Hydnocarpus wightiana* oil, either neutralized or with 10 per cent. gum solution, with no injury to the veins or symptoms of embolism, and that in leprosy cases raised skin lesions subsided after a few injections. L. R.

BARTMAN (J.). **Essai de traitement de la lèpre par de fortes doses des éthylo-éthers de l'huile de chaulmoogra.** Essai de traitement par l'iode. [Treatment by Strong Doses of Chaulmoogra Ethyl Esters or by Iodine.]—*Ann. Soc. Belge de Méd. Trop.* 1934. Mar. 31. Vol. 14. No. 1. pp. 7-18.

Five macular and one nerve case were treated with very large doses of up to 20 cc. of chaulmoogra ethyl esters without any benefit except

temporary improvement in the nerve case. He then tried giving up to 150 drops in 3 doses daily of 10 gm. iodine in 100 gm. of 94 per cent. alcohol in 17 cases, with or without previous esters, and he obtained uniform improvement of the macules, which became lighter in colour and less prominent. L. R.

BERNARD (P). Deux cas de lèpre traités par des injections intradermiques d'éther de chaulmoogra créosote. [**Two Leprosy Cases treated with Esters Intradermally.**—*Bull. Soc. Path. Exot.* 1933. Dec. 13. Vol. 26. No. 10. pp. 1235-1237.

In view of the good results reported from the Philippines and Calcutta following intradermal injections of hydnocarpus esters the author tried them in two cases with beneficial results on the thickened skin patches and on anaesthetic areas. L. R.

READ (Bernard E.). **The Toxicity of Sodium Hydnocarpate.**—*Internat J. Leprosy.* Manila. 1933. July. Vol. 1. No. 3. pp. 293-307. With 3 figs. [14 refs.]

After reference to earlier work on excessively large doses in animals causing toxic changes in the kidney, tests with doses more closely corresponding to those in use in man were made on rabbits and dogs with two preparations, firstly alepol (of which some half million doses have been supplied yearly to British possessions for some years past) and secondly one made from the palmitin-free relatively-lower-melting-point fatty acids of Taraktogenos oil; the latter proved the more toxic of the two. The conclusion is come to that long continued use of these preparations has a cumulative action and injuriously affects the kidneys and livers of the animals used in the tests, while ethyl esters were also not without harmful effects. Care therefore is required in selecting suitable concentrations and dosage in leprosy, and large doses of high concentration with a view to saturating the system are of doubtful value. L. R.

BERNY (P.). Effet comparatif de l'iode sur le rat sain et sur le rat lépreux. [**The Comparative Effect of Iodides on Healthy and Leprous Rats.**—*Bull. Soc. Path. Exot.* 1933. Dec. 13. Vol. 26. No. 10. pp. 1237-1239.

In view of the recorded intolerance of tubercular patients to iodides the author has worked out the minimal lethal dose of injections of potassium iodide, and found it to be nearly three times as great in healthy as in leprosy rats. L. R.

MONTEL (R.). Un nouveau traitement de la lèpre. Note préliminaire. [**A New Treatment of Leprosy.**—*Bull. Soc. Path. Exot.* 1934. Mar. 14. Vol. 27. No. 3. pp. 220-222.

Intravenous injections of 1 per cent. methylene blue have given good immediate results in four cases of leprosy, but it is too early to say what the ultimate results will be. The dye has a selective action on leprosy lesions; lepromas rapidly subsided and softened, erythematous patches faded and thickened nerves became smaller with improvement in sensation. L. R.

FERON (J). Action d'un complexe cupro-cinnamique sur quelques manifestations de la lèpre en Ethiopie. [**A Copper Cinnamon Compound in Leprosy.**—*Bull. Soc. Path. Exot.* 1934. Feb. 14 Vol. 27. No. 2. pp. 120-127. With 6 figs.

The author reports on the intravenous injection in 200 Ethiopian lepers of 3 cm. ampoules of "zimbyl-cuivre" with amelioration of the general health and of the sensory troubles, but no effect on advanced nodular cases L. R.

REITZ (H). **The Percutaneous Treatment of Leprosy.**—*Jl. Philippine Islands Med Assoc.* 1933 Nov. Vol 13 No. 11. pp. 511-527. With 16 figs. on 4 plates & 3 charts

This paper is remarkable for claiming good results, supported by some photos, "with a substance of suitable character" based on the principle that it should be soluble in the cholesterol fats of the skin and consequently be absorbed on being rubbed by the patient into the skin lesions, yet no mention is made of the actual preparation used. L. R.

PALDROCK (A.) & POOMAN (A). Die Beeinflussung der Lepraerreger durch Natriumthiosulfat. [**Sodium Thiosulphate in Leprosy.**—*Dermat. Woch.* 1934. Apr. 7. Vol. 98. No. 14. pp. 417-419. With 1 fig

The authors report on a trial of sodium thiosulphate in leprosy and conclude that it is ineffective L. R.

CHATTERJI (S. N). **Thickened Nerves in Leprosy in Relation to Skin Lesions.**—*Internat Jl. Leprosy* Manila. 1933 July Vol 1. No. 3 pp 283-292 With 10 text figs & 7 figs on 2 plates.

The clinical findings as regards thickening of the superficial nerves in a total of 3,079 cases, with such nerve lesions in 1,024, or 33 per cent, are discussed; in 542 more than one nerve was involved. Deep analgesia is usually less than superficial anaesthesia, but the latter persists longer in recovering cases. In the ascending type of nerve lesion the infection spreads by the lymphatics, and the whole length of nerves supplying anaesthetic patches should be palpated to detect thickening, as its occurrence is important in the diagnosis. In prognosis this lesion indicates a chronic case likely to improve slowly, and also activity of the disease requiring further treatment and the danger of a relapse if the patient is prematurely discharged. L. R.

MUIR (E.) & CHATTERJI (S. N). **Leprous Nerve Lesions of the Cutis and Subcutis.**—*Internat. Jl. Leprosy.* Manila. 1933. Apr. Vol. 1. No. 2. pp. 129-148 With 1 text fig. & 10 figs. on 5 plates. [13 refs.]

This paper should be read in conjunction with the foregoing one as it deals with the microscopical appearances in leprous thickened nerves, based on serial section of eight cases in which the edge or the whole of nerve dermal patch was removed to allow of early nerve lesions being studied. Thickened granulomatous cords were traced from the sub-cutaneous tissues into the cutis, and they often contained giant cells, but few or no bacilli; necrosis, caseation or cold abscess formation may occur in them. As they regard these as the earliest nerve lesions they suggest a minute and possibly filtrable ultra-microscopical stage of the *M. leprae* as the cause of the infection in the early stages. L. R.

DES ESSARTS (J. Quérangel) & LEFROU (G.) Notes sur l'histologie des macules anesthésiques de la lèpre. [**Histology of Macules.**—*Bull. Acad. Méd.* 1934. Apr. 17. 98th Year. 3rd Ser Vol. 111. No. 14. pp. 532-535.]

Sections of anaesthetic macules revealed characteristic lesions of diagnostic importance (in the frequent absence of lepra bacilli, which were only found in 18 per cent. of the cases) namely, lightly coloured nodules in the skin formed of epithelioid cells, capillaries and vacuoles as formerly described by VIRCHOW and by DARIER. L. R

DE JONG (R. de Josselin) Over tropho-neurotische atrophie in beenderen. (Naar aanleiding van een onderzoek van organen bij een lijder aan lepra mutilans) [**Neurotrophic Atrophy of Bones in Leprosy.**—*Nederl.-Tijdschr. v. Geneesk* 1934 Apr. 21 Vol 78. No. 16. pp. 1720-1727. With 10 figs. on 4 plates. French summary (7 lines).]

A description is given of a chronic nerve case of leprosy with extensive atrophy of the bones of the feet and hands with illustrations of the macro- and micro-scopical changes. He considers the lesions to be due to a neurotrophic atrophy due to the action of inflammatory changes in the peripheral nerves. L. R

SARDJITO & SITANALA (J. B.) Een verdere studie over leprabacillen in den dikken bloeddruuppel genomen van normaal uitzienende huid van leprozen. [**A Further Study of Leprosy Bacilli in the Thick Blood Drop from Apparently Normal Skin in Lepers.**—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1934. Jan. 16. Vol. 74. No. 2. pp. 91-102. [10 refs.]]

Acid-fast bacilli have now been demonstrated in thick blood drops taken from the unaffected skin of sufferers from nodular leprosy by many observers. It has further been shown that many more bacilli are present in the blood-drop film than in serum obtained by a prick of the margin of the ear after rendering it anaemic by clamping with a forceps. Upon pricking the anaemic skin an oozing of serum is obtained from which films are made, and by relaxing the clamp a flow of blood occurs which serves for the thick blood-drop preparation. Special importance is attached to the presence of the large numbers of bacilli in the blood drop, for it is taken to indicate that leprosy bacilli are circulating in the blood and present in the blood capillaries before they secondarily invade the tissues to give rise to lepromata. This is why a serum film from apparently sound skin shows fewer bacilli than the blood from the same part, for the bacilli are in capillaries, not in the tissue fluid. A number of sufferers too from nerve leprosy show the same thing, although not to the degree that obtains in nodular leprosy.

W. F. Harvey.

STEIN (A. A.) & STEPÉRIN (M. I.). Om leprabacillenes utskillelse hos spedalske. [**Excretion of Leprosy Bacilli by Lepers.**—*Norsk. Mag. f. Lægevidenskapen*. 1934. Mar. Vol. 95. No. 3. pp. 278-280.]

The investigations recorded in this paper were conducted at the "Krutijje Rutschji" leper hospital near Leningrad. It was found

that the bacillus of leprosy could be demonstrated in the skin of lepers even in those areas where it had not, apparently, been diseased.

The technique adopted for the bacteriological examination of the fluid constituents of the skin was as follows: The skin was incised with a scalpel so superficially that no blood was drawn, only lymph. Another way of obtaining lymph was to provoke vesicles by freezing with carbonic acid snow. Both these procedures were applied to the apparently healthy skin of the upper arm where, according to the patients' statements, there had never been any rash. At the same time a bacteriological examination was made of the nasal mucosa of all the 97 patients, and of the 49 members of the staff of the hospital. The findings, recorded in 5 tables, emphasize the dominant rôle played by the nasal mucosa in the excretion of the bacillus of leprosy. In 11 cases it was found in the nasal mucosa in the absence of any macroscopic changes in it. The two methods of examining the skin already described yielded positive results in a considerable proportion of cases and, what was still more important, the bacillus of leprosy was found by this means in three patients who no longer showed any other sign of leprosy, and in whose nasal mucosa this bacillus could no longer be found even after the exhibition of potassium iodide. These findings show how very careful the medical officer of a leprosy hospital must be in his examination of patients before giving them their discharge. Although PAWLOW and others have demonstrated the bacillus of leprosy in members of the staffs of leper hospitals, none of the 49 attendants examined by the authors was found to harbour this bacillus, although the nasal mucosa was examined repeatedly in the case of the doctors and nurses

C. Lillingston.

ARIZUMI (Saburo). **On the Blood Picture of Lepers.**—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1933 Nov. Vol. 32. No. 11 (344). [In Japanese pp. 1549–1566. [24 refs.] English summary pp. 154–155.]

In leprosy the red corpuscles are reduced in numbers and a fairly high proportion of basophil-punctated and polychromatophils are found, together with some anisocytosis and a few poikilocytes, but no nucleated forms. The leucocytes were always increased, especially in advanced active nodular cases, with some decrease in the lymphocytes, and the eosinophiles are few but may become increased. The haemoglobin is decreased in proportion to the activity of the cases, and the haemoglobin index is rather low.

L. R.

ISWARIAH (V.) & NAIR (V. G.). **Observations on Erythrocyte Sedimentation with Special Reference to Leprosy.**—*Jl. Indian Med. Assoc.* 1934. Feb. Vol. 3. No. 6. pp. 231–235. With 5 graphs.

The authors have studied the sedimentation rate of the red corpuscles in the citrated blood of lepers and they disagree with the conclusions of MUIR and others [see this *Bulletin*, Vol. 27, p. 338], for they found the rate did not give a reliable indication for treatment and that cases with a high rate did well with regular hydnocarpate treatment.

L. R.

- LEFROU (G.) & BONNET (P.). Déséquilibre protéique du sérum sanguin dans la lèpre. [Blood Proteins in the Blood of Lepers].—*Bull Acad. Méd.* 1934. Jan. 30. 98th Year. 3rd. Ser. Vol 111 No 4 pp. 175-177.
- & —. L'équilibre protéique du sérum sanguin des lépreux.—*Bull. Soc. Path. Exot.* 1934. Jan. 10. Vol. 27. No. 1. pp 35-45. [Refs. in footnotes.]
- & —. Les modifications de l'équilibre protéique du sérum sanguin comme élément de diagnostic précoce de la lèpre.—*Bull Acad. Méd.* 1934. Mar. 27. 98th Year. 3rd Ser. Vol. 111. No. 12. pp. 433-435.

The first two of these papers deal with estimations of the total proteins and of the proportion of serum globulin and of serum albumin in 65 lepers, in 28 of whom only were lepra bacilli found, and many showed only nerve symptoms and anaesthetic patches. Nevertheless, in all of them characteristic blood changes were found in that the total amount of albumen is normal or increased, the serum globulin was always increased, but the serum albumin was normal or diminished. In the third paper the diagnostic value of this blood change is discussed and the conclusion is come to that while the change is not specific, as it may be present in syphilis, tubercle and cancer, yet it is of diagnostic value when any signs of leprosy are present, since the Vernes reaction will usually allow syphilis to be excluded

L. R

- i. DUVAL (C. W.) & HOLT (R. A.). Failure to enhance the Growth of *B. leprae* by Wherry's Gaseous Method (CO_2 , O_2 Environment).—*Proc Soc Experim. Biol. & Med.* 1934. Jan. Vol. 31. No 4. pp. 453-455.
- ii. HOLT (Rebie A.). Studies with Chick Embryo Tissue in Cultivation of *B. leprae*.—*Ibid.* Feb. No. 5. pp 567-569.

i Duval and Holt record their failure to confirm the recent claims of WHERRY, and of SOULE and MCKINLEY [this *Bulletin*, Vol. 29, p 549, Vol. 30, p. 238] that an environment of CO_2 and O gases enhances the growth of *M. leprae*, for they could obtain no evidence of any influence of these gases on the growth of the bacilli.

ii. In the second note, Holt records that he could obtain no clear evidence of any multiplication of the *M. leprae* in chick embryo tissue cultures, as claimed by MCKINLEY and VEDER, and he points out the difficulties in estimating whether any actual multiplication of the organisms has taken place, due to concentration of them with the autolysing of the leprous tissue present and other fallacies. He even found evidence of degeneration and loss of viability after four months in such culture media, and concludes that in his experience chick-embryo tissue emulsified in Tyrode's solution is *per se* valueless as a nutritive in the *in vitro* cultivation of *M. leprae*.

L. R.

HOLT (R. A.). Use of Living Chick Embryos in the Propagation of *B. leprae*.—*Proc Soc. Experim. Biol. & Med.* 1934. Mar. Vol. 31. No. 6. pp. 643-645.

— Morphological Resemblance of the Rod Shaped Pigment of the Chick Retina to *B. leprae*.—*Ibid.* pp. 645-648. With 4 figs.

In the first of these notes the author reports an attempt to cultivate lepra bacilli of nodules by GOODPASTURE's method of inoculating

incubated fertile hens' eggs upon the chorio-allantoic membrane, but he could obtain no evidence of multiplication of the bacillus

In the second note he gives illustrations of the microscopical resemblances between the globi of leprous nodules and the rod-shaped pigment within the epithelial cells of the retina of embryo chicks, but they can be distinguished by Ziehl-Neelsen staining. L R

SALLE (A J) & MOSER (J R) **Bacteriology of Leprosy. II. Growth and Staining Reactions of Organisms inoculated into Minced Chick Embryo Medium.**—*Proc Soc Experim Biol & Med.* 1934. Mar. Vol. 31 No 6. pp 725-726

— & — **III. Growth and Staining Reactions of Acid Fast Organism inoculated into Minced Animal Tissues.**—*Ibid.* pp 727-728.

In the first of these short notes the authors report that on cultivating acid-fast organisms isolated from human and rat leprous lesions on fresh tissue cultures and in minced embryo medium both acid-fast and non-acid-fast organisms are found during the first two days, but the acid-fasts then diminished and nearly disappeared by the tenth day. On transferring to fresh similar media the same thing is repeated, but this does not occur with numerous other non-acid-fast bacteria on the same media. As both human and rat bacilli behave in the same way they think those infections are caused by the same bacilli.

In the second note they record the use of minced organs of rabbits, guinea-pigs and rats in Tyrode solution as culture media for lepra bacilli, and they obtained good growth in the two former but not in the rat tissues, the organisms lost their acid fastness in about five days. They therefore conclude that living embryonic tissues are not necessary for obtaining cultures. L. R.

HOFFMANN (W. H.). **The Granular Forms of the Leprosy Bacillus.**—*Internat. Jl. Leprosy.* Manila. 1933. Apr. Vol. 1. No. 2. pp. 149-158. With 4 figs. on 1 plate.

From a study of the granular forms of the leprosy bacillus the author concludes that the well-known granules within the bacilli, and as free-living bodies, are a part of its evolutionary cycle, and as they vary in size down to the limits of visibility it is possible that invisible and filterable forms exist of unknown significance. It is also possible that they are the result of degeneration and disintegration of the bacilli, due in part to the defensive mechanism of the organism and in part to the action of medicinal products, and especially of chaulmoogra oil, in which case their presence can be considered a favourable sign. He, however, thinks they should not be considered solely as degenerate forms, for in some cases they seem to be especially resistant or young forms, and may even serve to propagate and preserve the species or be responsible for relapses. Their true nature will only be discovered by further investigations. L R.

PESCHKOWSKY (J. W.). **Ueber Reaktionen bei Lepra. [Leprosy Reactions.]**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934. Mar. Vol. 38. No-3. pp. 112-118.

The cellular changes in leprosy reactions are discussed and the author finds that a monocytosis is unfavourable clinically and prognostically,

but a lymphocytosis is more favourable. An increase of the polynuclears in the blood with enlargement of the glands, which may break down, accompanied by destruction of the lepra bacilli, may result in a temporary increased immunity developing in the course of the disease.

L. R.

LAIGRET (J.) Réactions des lépreux vis-à-vis de certains extraits du bacille de la lèpre des rats [**Reactions of Lepers to Intradermal Injections of Rat Leprosy Bacilli.**—*Arch. Inst. Pasteur de Tunis.* 1933. Dec. Vol. 22 No. 4 pp. 509-512.]

Sterilized suspensions of rat leprosy bacilli were injected intradermally into three cases of mixed and one of nodular leprosy, and control injections were made in healthy and tuberculous subjects. Positive reactions in the form of congestion, sometimes accompanied by papules or even ulceration persisting for several weeks, occurred in 3 of the 4 lepers, in 1 of 2 normal subjects, and negative ones in the remainder, so no conclusions are possible. An antigen was also made from the rat leprosy bacilli for complement deviation tests with the serums of lepers, with positive results in 3 lepers, in 2 leprosy rats, in 2 of 6 tuberculous cases and in 3 of 4 syphilitic serums. He concludes that a negative reaction will exclude leprosy, but a positive one will only be of value if tubercle and syphilis can be excluded.

L. R.

YOSHIMURA (Yasunori) Ueber die Funktion der Schweissdrüsen an der leprosen Flecke. [**Function of Sweat Glands in Leprous Patches.**—*Japanese J. Dermat. & Urol.* 1934 Feb Vol. 35 No. 2 pp. 105-156. With 37 figs. [80 refs.] [In Japanese. German summary pp. 17-18.]

This paper describes the changes in the sweat glands in leprosy patches and should be read in the original by those interested.

L. R.

- i. BERNARD (P.). Leucocytes et bacilles de Stéfansky dans le péritoine du rat et du cobaye—*Bull. Soc. Path. Exot.* 1934. Jan. 10. Vol. 27. No. 1. pp. 12-17.
- ii. —. Localisation des bacilles de Stéfansky injectés dans la veine du rat.—*Ibid.* Feb. 14. Vol. 27. No. 2. pp. 117-120.
- iii. CHORINE (V.). Conservation du bacille de Stéfansky.—*Ibid.* Mar. 14. Vol. 27. No. 3. pp. 222-224.
- iv. TISSEUIL (J.) & CHORINE (V.). La coloration par la fuchsine ne tue pas le bacille de Stéfansky.—*Ibid.* pp. 224-225.
- v. LAIGRET (J.). Reproduction de la lèpre murine chez le cobaye et chez le lapin, traités par un extrait acétonique de bacilles tuberculeux. [**Investigations on Rat Leprosy.**—*C. R. Acad. Sci.* 1933. Dec. 4. Vol. 197. No. 23. pp. 1468-1470.]

i. In this short note Bernard records the leucocyte response to the intraperitoneal injection of Stefansky's bacillus of rat leprosy in rats and in guinea-pigs. In the former there is a great majority of lymphocytes, but in the guinea-pig the original high lymphocyte count is replaced by an increase of the polynuclears after four hours. A phagocytic action occurs, especially in the polynuclears, which undergo degenerative changes.

ii. This note records that Stefansky's bacilli were injected into the tail vein of rats and their subsequent distribution in the tissues of the

body was investigated. They were found to accumulate especially in the liver in the cells of Kupffer, which appear to destroy a portion of the organisms within 24 hours. In the spleen they are found in the venous sinuses at the periphery of the Malpighian bodies, where they become absorbed by the macrophages. They traverse the lungs, kidney and brain without being retained in them.

iii. The author recalls that E. MARCHOUX showed that the pathogenicity of the rat leprosy bacillus can be maintained in 40 per cent. glycerine in ice for 18 months, and at his request the author determined the limit of such preservation and found they survived up to 29 months, but not up to 51 months.

iv. Tisseuil and Chorine have found that staining Stefansky's bacillus by fuchsin does not kill it as they can still produce the disease in rats.

v. The author records the successful production of rat leprosy infection in previously refractory animals, guinea-pigs and rabbits, by treating them with acetone extracts of B.C.G. after injection with Stefansky's bacillus.

L. R.

GILLIER (R.) & TISSEUIL (J.). Essais de traitement de la lèpre du rat. Troisième série. [Treatment of Leprous Rats.]—*Bull. Soc. Path. Exot.* 1934. Feb. 14. Vol. 27. No. 2. pp. 189-199.

Rats were infected by injections of material containing Stefansky's bacillus and treatment was commenced eight days later. Only retardation of the evolution of the disease was obtained by the following preparations classed in order of efficacy: tubercular extracts in methyl alcohol and in acetone, chlorides of nickel and of cadmium, and sulphate of cobalt and ammonium

L. R.

BRITISH EMPIRE LEPROSY RELIEF ASSOCIATION. The Shadow of Leprosy: being the Annual Report for 1933 of the British Empire Leprosy Relief Association.—32 pp. With 6 figs. London: 29 Dorset Square, N.W. 1.

DELANOE (E). Traitement mixte de la lèpre tubéreuse, chez une femme marocaine.—*Bull. Soc. Path. Exot.* 1934. Feb. 14. Vol. 27. No. 2. pp. 127-133.

GRAMBERG (K. P. C. A.). De beteekenis van de polikliniek in den strijd tegen de lepra op Java.—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1934. Mar. 13. Vol. 74. No. 6. pp. 325-332.

MONTAÑES (P.) & NEGRO (E.). El test-histamina en el diagnóstico precoz de las manchas leprosas.—*Rev. San. e Hig. Pública.* 1934. Jan. Vol. 9. No. 1. pp. 11-15.

PALDROCK (A.). Ulcera ventriculi bei einer Leprosen.—*Dermat. Woch.* 1934. Feb. 24. Vol. 98. No. 8. pp. 241-242. With 3 figs.

STEIN (A. A.) & STEPERIN (M. I.). Om leprabacillenes utskillelse hos spedalske.—*Norsk. Mag. f. Lægevidenskaben.* 1934. Mar. Vol. 95. No. 3. pp. 278-280.

VAAMONDE FERNANDEZ (J.). Contribución al estudio de la lepra en Galicia.—*Rev. San. e Hig. Pública.* 1934. Feb. Vol. 9. No. 2. pp. 97-107.

VIGNE (Paul) & DUSAN (J.). Un cas de lèpre décelé par la réaction de Rubino.—*Marseille-Méd.* 1933. Nov. 5. Vol. 70. No. 31. pp. 515-517.

SLEEPING SICKNESS.

BARLOVATZ (A) **Course, Prognosis and Classification of Human Trypanosomiasis.**—*Ann Trop Med. & Parasit.* 1934. Mar. 29 Vol 28 No. 1. pp 1-20. With 1 chart.

It is customary to divide sleeping sickness into three periods, which are believed to succeed each other: the first period showing trypanosomes in the blood and lymphatic glands with a normal cerebrospinal fluid; the second in which the spinal fluid is not normal, but signs of nervous disease are not seen; the third period characterized by nervous signs. In the present paper observations are recorded which seem to show that these periods do not always follow each other regularly, that it is hardly possible to set a time limit to them, and that chronic conditions occur in patients in apparently perfect health.

Barlovatz argues that if sleeping sickness passes regularly through various stages, one would expect to find few pathological spinal fluids in recent cases and more in old cases. In order to test the point he has made a series of lumbar and occipital punctures during routine examinations of native populations. He chose districts where regular and periodic examinations of the whole population are made, and claims that it is safe to consider that most of the patients, found for the first time to be infected at any one examination, must have fallen sick during the interval between that examination and the previous one. Diagnosis was made by finding the trypanosome in the cervical glands, and only patients who had received no treatment are considered. The results of this work are summarized in a table, in which it is seen that there are no striking differences in the distribution of the cases showing cerebrospinal fluid changes whether the previous examination took place 7 months, 2 years, 3 years earlier, or never before. Strangely enough, the figures are best for those groups where no previous examination had been made, and in which consequently there are presumably most old cases. Barlovatz comments on the fact that the proportion of third period patients seen in endemic areas never, or seldom, visited before is often strikingly low, being usually less than 3 per cent. of the total number of patients.

The results obtained from these observations suggest to the author that pathological changes in the spinal fluid may progress very slowly, and furthermore that they may appear in a patient and subsequently disappear without treatment. To test this, a number of cases of human trypanosomiasis were subject to repeated lumbar and occipital puncture before treatment was commenced, and the results are set forth in a series of graphs. These graphs, which are exceedingly interesting, show that there is no general or regular upward trend of the leucocyte and protein curves, but that both rise and fall in an irregular manner in the same patient; the leucocyte and protein curves sometimes converge and at other times diverge. Barlovatz lays particular stress on the fact that the protein curve may rise and fall freely without treatment.

In 1927, Barlovatz made weekly lumbar punctures on third period patients who were receiving weekly doses of tryparsamide, and who, after an initial improvement, failed to profit further from the treatment; in these cases, the cell count often showed fluctuations which could not be explained by the amount of drug given, or by changes of diet or habit, as all these factors were constant. The author considers that observations on patients whom drugs failed to sterilize are to be considered as comparable with observations on untreated cases.

MURAZ and VAISSEAU (1932) record that tryparsamide sometimes fails to sterilize the peripheral circulation, and yet pathological changes in the cerebrospinal fluid may disappear. Barlovatz himself has recorded observations on a series of arsenic resistant cases in about two-thirds of whom the spinal fluid was normal. An observation is recorded on a patient whose cell count dropped from 440 to 3 within a period of 10 weeks, although no treatment was given.

Barlovatz had an opportunity in 1932 of examining a group of natives who were all recognized as suffering from sleeping sickness by gland puncture in July, 1929. So far as the author could ascertain it seemed almost certain that at least 14 of the 17 patients comprising the group had never been treated. Six of the 14 were said to be dead in 1932, when Barlovatz visited the district; all the remaining 8 were in apparent health, and in only one was the spinal fluid not normal. Details regarding these cases are given in a table which is here reproduced.

Cases diagnosed July 1st, 1929, by gland puncture, and examined (except those said to be dead) in September and October, 1932

Said to have died ...	1. Shatshoma 2 Muatshmana 3 Tshamba 4 Mualukengeta 5 Shatshikoko 6 Humbula 7 Shatende	
Living 2 injections 1930	8 Shahumbula	Trypanosomes in lymph nodes. 5 blood centrifugations negative. Spinal fluid quite normal General condition good
Living 12 injections 1931	9 Kangombe	Neck glands infected Blood centrifugation negative Nervous. Cell-count in spinal fluid 48 Apparently cured
Living No treatment	10 Mukungu 11 Shatshikendu	Apparently cured Good health, no sign of disease, but during winter 1932-33 spinal leucocytosis lasting several weeks Trypanosomes in heart blood of inoculated rabbit
	12. N'gombe	Trypanosomes found once in centrifuged blood in Oct., 1932, but never since
	13. Muyeketa	Neck glands negative. Blood centrifuged 14 times, trypanosomes found once. Spinal fluid normal.
	14. Tshibue	Neck glands typical, but negative 4 times. On centrifugation blood 6 times positive and 12 times negative. Spinal fluid quite normal
	15. Masangu	Neck glands positive Centrifuged blood twice positive and 13 times negative. Spinal fluid quite normal
	16. Tshihuna Nama	Neck glands positive Spinal fluid quite normal.
	17. Mukuta	Neck glands positive Blood positive Slight leucocytosis in spinal fluid.

In another table these 8 cases are grouped as follows :—

Cured · Mukungu.

Silent trypanosomiasis : Spinal fluid normal · N'gombe, Shatshikendu, Muyeketa, and Tshibue ; the first two of these recovered spontaneously in 1933

Cervical glands positive. Spinal fluid normal : Masangu and Tshihuna , spinal fluid not normal : Mukuta.

In still another table the results are recorded of weekly examinations of 7 of these patients and one other for trypanosomes by the method of triple blood centrifugation ; of the 92 triple centrifugations made only 12 were positive.

The case histories of each of these patients is then given in detail. The existence of these very protracted cases leads to the question whether they are bound to end fatally. The immediate causes of death in sleeping sickness are usually wasting and secondary infections. Wasting may be a consequence of fever or may follow upon the impaired psychic power in advanced cases. Barlovatz has examined the corpulence index in a large number of cases in various stages of the disease. The index was obtained by subtracting from the height of the patient the sum of the following circumferences.—Waist, neck, and left arm midway between the shoulder and elbow taken twice. Low numbers indicate sturdy build and high numbers slender build or wasting. A difference was found between normal and sick individuals, but it was small. No definite difference was, however, found between patients with normal spinal fluid and those with pathological spinal fluid. Barlovatz concludes that patients who have overcome the fevers which are highest at the onset of the disease, and whose nervous system remains unimpaired, need not die at all. There can be no doubt that trypanosomiasis is quite consistent with good general health.

The author concludes this very interesting paper with the following summary :—

" 1. Proportion of diseased spinal fluids in large groups of patients and degree of abnormality of these fluids bear no relation to the time presumably elapsed since infection.

" 2. Cell-count and albumen content of spinal fluid show irregular fluctuations sometimes at short intervals. Both these features may diminish without treatment and may very probably subside altogether.

" 3. Small groups of patients resistant to the drugs given, or having relapsed several times, had a high proportion of normal fluids. So had a number of patients who escaped treatment during 3½ years.

" 4. Classification of cases according to the state of the spinal fluid is rather a measure of the seriousness of the disease and a help to prognosis than a means of ascertaining the time of infection.

" 5. Possibly there is in trypanosomiasis, as in syphilis, a slight meningeal reaction shortly after infection. This reaction may disappear without developing immediately into brain and medulla localizations.

" 6. There are silent forms of human trypanosomiasis which any ordinary investigation, including inoculation into animals, fails to detect. Investigation is needed to ascertain whether such forms are likely to carry the disease into new areas.

" 7. These silent forms resemble closely what is sometimes seen after apparently successful treatment. They emphasize the part which natural resistance may play in the cure of sleeping sickness.

" 8. Human infections by *T. gambiense* may sometimes disappear spontaneously. It would seem that such a disappearance, when taking place, is a matter of years."

W. Yorke.

FAIRBAIRN (H) **Lange's Colloidal Gold Reaction and the Estimation of Total Proteins in the Cerebrospinal Fluid of Rhodesian Sleeping Sickness, and their Significance in Prognosis.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934. Mar 12 Vol 27. No 5. pp 471-490. [17 refs.]

The author made careful examinations of the cerebrospinal fluid during the course of treatment of a considerable number of cases of sleeping sickness with the object of ascertaining which of the various reactions furnish most reliable information on which to base a prognosis. Protein estimation was found most useful.

While all workers agree that treatment can be adequately controlled only by lumbar puncture, yet there is considerable evidence that the mere enumeration of cells and observations regarding the presence or absence of trypanosomes are not sufficient on which to base a prognosis. Various authors are cited in support of this contention. In following up cases one occasionally meets with very high cell counts, for which there is no obvious reason, but which cause great difficulty in prognosis. Three such examples are given. Similarly, the number of trypanosomes in the spinal fluid can fluctuate greatly. KEEVILL (1926) records a case where 750 trypanosomes were found per cmm. in the spinal fluid, and yet six days later, although there was no further treatment, only a single trypanosome was found after a prolonged search [See KLEINE, this *Bulletin*, Vol. 28, p. 893.]

The present work was commenced in March, 1931, in the Kahama sleeping sickness area of Tanganyika, and the cases were kept under observation until July, 1933. In a very interesting series of tables the author summarizes the results of repeated examinations of the spinal fluid in a considerable number of cases during and after treatment. In these tables information is given regarding the duration of illness before treatment, the nature of the treatment, the dates of lumbar puncture, and the results of examination of the spinal fluid in respect of (1) the presence or absence of trypanosomes, (2) the cell count, (3) the amount of protein, and (4) the colloidal gold curve.

The first table shows the results of repeated lumbar puncture of 12 patients who were at the time of writing alive and well after one course of treatment. Table 2 gives similar information regarding the 12 who received more than one course of treatment, and Table 3 contains information regarding 6 patients who died.

Discussing the information supplied by these tables, Fairbairn considers that it provides an answer to the following two questions:—

- (1) Why is Bayer 205 unable to cure the 25 per cent. or so of cases with a history of less than one month's illness?
- (2) How can one select those cases with a history of over one month's illness who are curable either by Bayer 205 or by a combined use of Bayer 205 and tryparsamide?

Apparently, in some patients giving a short history, the trypanosome infection causes an early damage to the central nervous system, this is shown by a high percentage of protein in the cerebrospinal fluid. Such cases are not curable by Bayer 205 alone, and possibly not curable at all. On the other hand, there are patients who give a history of being ill for more than one month, and yet the percentage of protein in the cerebrospinal fluid is low (indicating an intact nervous system); such patients are easily cured.

Fairbairn considers that the duration of the illness or the division of cases according to whether the spinal fluid has more or less than 20 cells per cmm is only a rough clinical guide to the condition of the patient. He agrees with SICÉ that the amount of protein present in the spinal fluid is the sole basis of prognosis [see this *Bulletin*, Vol 27, p. 820]. If at the beginning of treatment the protein is 0.03 per cent. or under, the prognosis is good and the patient can be cured (possibly by Bayer 205), but if the protein is 0.05 per cent. (and probably as low as 0.035 per cent. the prognosis is bad even with combined Bayer 205-trypanamide treatment. In cases of doubt, *i.e.*, where the figure is between 0.03 per cent. and 0.035 per cent., the combined treatment should be used. The value of the estimation of the total protein is even more apparent in those cases with trypanosomes in the spinal fluid.

Fairbairn considers that the estimation of the cerebrospinal protein is a very great help in deciding the question whether a case is a relapse or a reinfection. Examples are given. In one case between June 3rd, 1931, when treatment stopped, and July 4th, 1933, when trypanosomes were found in both blood and spinal fluid, the cell count was between 4 and 9 cells per cmm., but the protein, 0.07 per cent. before the second course of treatment, had sunk to a trace and risen to 0.035 per cent. 9 months before the "relapse." In another case, in the 13 months between the end of treatment and the blood again showing trypanosomes, the spinal fluid protein had fallen to 0.016 per cent. and had remained there. This case is considered to be a "reinfection."

Standard of cure.—The author quotes SICÉ to the effect that it is important to continue treatment so long as the cerebrospinal fluid does not contain less than 10 cells per cmm., and 0.015 per cent. to 0.025 per cent. protein. Fairbairn draws attention to the fact that in all cases summarized in his first table the protein had returned to 0.02 per cent. or less, although there might still be as many as four cells per cmm. With the object of inquiring further into this very important matter the cases treated by Fairbairn in the Maswa District between February, 1925, and November, 1926, were re-examined. The results, which are set forth in a table, show that in only one patient was the protein over 0.03 per cent.

The colloidal gold reaction.—The author's results on this reaction support SICÉ's contention that while it is useful it has not the same value as the protein estimation. In the early stages of the disease the colloidal gold reaction is "tabetic" in type and the extent of the reaction appears to run parallel to the percentage of protein present; in the later stages of the disease, however, a general paralysis type of curve may be met with. A change from the later type to the former indicates an improvement in the clinical condition of the patient, but it would appear when once the general paralysis type of curve is found, the ultimate prognosis is hopeless, notwithstanding the fact that some immediate improvement may occur.

The following summary is given :—

"(1) The cerebrospinal fluids of a number of sleeping sickness patients (*T. rhodesiense* infection) have been tested with Lange's colloidal gold reaction, and the total proteins present estimated.

"(2) The estimation of the total protein present is the best guide to prognosis. It is also the best evidence in deciding when a patient is cured, and whether the case is one of relapse or reinfection.

"(3) The colloidal gold reaction is influenced by treatment earlier than the percentage of protein present, and is, therefore, not so useful in prognosis. In general, the reaction is 'tabetic' in type, the intensity running parallel to the amount of protein present, but when a general paralysis type of reaction is obtained, it is of grave prognostic significance."

W. Y.

MACPHERSON (A). **The Critical Diagnosis of Infection by *Trypanosoma gambiense*.**—*Jl. Trop. Med. & Hyg.* 1934 Jan 15 & Feb. 1. Vol. 37. Nos. 2 & 3 pp. 17-22; 37-43. With 23 figs [11 refs.]

The object of the author is to depict the clinical phenomena caused by the trypanosome, excluding the phenomena resulting from the terminal meningo-encephalitis. He writes that clinical diagnosis is stated to be difficult, whilst diagnosis by laboratory methods is easy. When, however, no sleeping cases obtrude themselves to indicate the presence of the disease, it is impossible, without a critical knowledge of the clinical appearance in the early stages, to find cases upon which to practise laboratory diagnosis.

According to Macpherson the clinical evidence of the presence of trypanosomes in the body may be divided into several syndromes with, in addition, certain skin and eye symptoms. These are:—(I) Syndrome of parasites in the circulatory system; (II) Syndrome of thyroid involvement, (III) Skin symptoms, (IV) Eye symptoms; (V) Syndrome of lymphatic invasion; (VI) Psychic syndrome, (VII) Syndrome of meningo-encephalitis. These various syndromes are discussed in great detail and must be consulted in the original by those interested, as it is impossible to summarize them here.

[In the reviewer's opinion, these papers are open to much criticism. A good deal of the matter is highly speculative and not based on any sound foundation of fact; and furthermore it is very doubtful whether many of the signs and symptoms described are really the result of trypanosomiasis and not due to concurrent conditions. One or two examples might be cited. In discussing the anaemia, Macpherson writes:—

"*Anaemia*—This is almost invariably a sign, and only noted in a thorough examination of the patient. This anaemia may be due in part to destruction of the red blood-corpuscles by the parasites, for in a fresh blood-film the red corpuscles may be seen to be attacked by the rapidly moving trypanosome, and in part the result of toxin secreted by the trypanosomes destroying the red cells. This anaemia is not a constant or a marked feature after the parasites have left the circulatory system. Cases in the late stages are seen with normal red cell counts and a high haemoglobin percentage."

The author's remarks on splenic enlargements are equally unsatisfactory. He has apparently not even contemplated the possibility that the patient might also suffer from malaria. Splenic cough is stated to be a very valuable symptom. It is a dry cough due to an impeded diaphragm, and also, possibly, a reflex irritation from the spleen.

After carefully reading these papers, the reviewer is of opinion that instead of clarifying the clinical picture of the disease, they make the task of recognizing it from clinical observations distinctly more difficult.]

W. Y.

VAN HOOF (L) & HENRARD (C) La transmission cyclique de races résistantes de "*Trypanosoma gambiense*" par "*Glossina palpalis*." (Note complémentaire.) [Cyclical Transmission of Resistant Strains of *T. gambiense* by *G. palpalis*].—*Ann. Soc. Belge de Méd. Trop.* 1934. Mar 31 Vol. 14. No 1 pp. 109-144. With 1 fig. [11 refs]

The objects of the work described in this paper were, firstly to study the behaviour of strains of *T. gambiense*, obtained in various parts of the Belgian Congo, in the tsetse and in the vertebrate host, their transmissibility and sensitiveness to the usual drugs Secondly, to re-examine the effect of a mechanical transmission to a guineapig or monkey on the cyclical transmissibility of the strains. [In a previous paper the authors stated that a strain had lost its transmissibility as the result of a single mechanical passage through a guineapig, and the reviewer had cast some doubt on the validity of this conclusion in his summary of the paper in question, this *Bulletin*, Vol 30, p. 774.] Thirdly, to test the conservation of drug resistance through one or more cyclical developments of the strains in tsetse

Having drawn the attention of their medical colleagues to the frequency of arsenic resistance in human trypanosomiasis, the authors had little difficulty in obtaining a number of resistant strains Details of nine such strains are given. An attempt was made to transmit each of these strains by *G. palpalis*. The flies were fed by preference on the patient himself, but if this proved impossible they were fed on an animal inoculated from the patient.

The results of the various experiments are given in detail in a table here reproduced.

	Date of the Experiment	No. of flies dissected	No. of flies infected	% of infections	No of infected flies living on the 10th day		No of infected flies living on the 15th day		Proven-tricular index	Salivary gland index
					prov	total	s. g	total		
Malanda	8 2 33-10 4 33	121	20	16.53	3	12	2	8	4 12	4 12
Kindila	8 3 33-1 5 33	101	10	10	1	8	0	7	1 25	0
Pota J	5 4 33-30 5 33	122	15(1)	12.29	14	15	6	14	11 47	5 27
Bele Mat	17 4 33-30 5 33	23	3	13	2	2	1(2)	2	13	6 5
Bunga S	19 4 33-12 6 33	119	24(3)	20.17	6	17	1(2)	10	7 12	2 02
Onéma J	27 5 33-14 7 33	136	4	3	2	4	0	3	1 5	0
Zita K.	5 6 33-8 8 33	109	19	17.43	2	15	1	7	2.32	2.49
Ibongi C	17 7 33-18 10 33	207	12	5.8	6	12	5	12	2 4	2 4
Marçal	17 8 33-4 10 33	140	2	1.4	1	2	1	2	0 7	0 7
Kongolo	5 9 33-20 10.33	67	0	0	0	0	0	0	0	0
L										

Notes.—The proventricular findings have been calculated in taking into account the infected flies living at the 10th day of the experiment, because it was on this date that we were able to observe the most recent infection of the proventriculus.

1. An intestinal infection that we estimated to be secondary to the infection of the animal to which the strain was transmitted is not taken into account.

2. Probably.

3. Two late and probably secondary intestinal infections are not taken into account.

The authors point out that certain notable differences are exhibited by the various strains in their capacity to develop in *Glossina*. Certain strains, such as Bunga S, give a relatively large proportion of intestinal infections as compared with a few proventricular and salivary gland infections; whilst others, such as Ibongi C strain, give a relatively

high gland infection. Still other strains, *e.g.*, Kindili, Onéma and Kongolo, were found to be non-transmissible. The authors state that whilst they do not desire to take part in the controversy regarding the significance of proventricular infections, they wish to draw attention to the fact that the index of the infection of these is equal to, or greater than, that of the salivary glands. The differences in the transmissibility index of the various strains could not be correlated with their place of origin, with their degree of drug-resistance, or with their pathogenicity for the vertebrate.

The authors next return to the point raised by them in their previous paper, *viz*, that the transmissibility of the strain had been lost as the result of a single passage through a guineapig. They have endeavoured to repeat this observation, but without success.

Details are then given of a series of experiments which show that the character of arsenic resistance is transmissible through several cycles in *Glossina*. The strain used is that from the patient Momfo Essa on which the authors conducted their earlier experiments on this subject. This patient had a normal cerebrospinal fluid, but the infection proved insensitive to repeated doses of 2 gm. of tryparsamide and also to repeated injections of 0.5 gm. of Dn 12; on the other hand it responded readily to Bayer 205. *G. palpalis* were infected from the patient, and the infection was transmitted to a monkey and 3 guineapigs. The monkey was used to test the sensitiveness of the strain to germanin. Guineapig 21 was given an injection of 0.15 gm. of tryparsamide without affecting the infection. It was then decided to use this animal for a second cyclical transmission, and finally it was given a dose of 0.5 gm. of tryparsamide again without results. Guineapig 22 received successively doses of 0.1 gm., 0.25 gm per kilo of tryparsamide, and finally 0.04 gm of Dn 12 without any action on the infection. Similarly, Guineapig 23 proved resistant to an injection of 0.02 of Dn 12.

G. palpalis were then infected from Monkey 15 and from Guineapig 21. The flies infected on Monkey 15 in turn infected Guineapig 29 and Monkey 5, and those fed on Guineapig 21 infected Guineapigs 34 and 38. Attempts to carry on the strain by cyclical transmission from Monkey 5 failed, but flies were infected from Guineapig 38 and transmitted the infection to Guineapig 49. Details regarding the reaction to various drugs on the infection in these various animals are given. The results indicate that the drug-resistance was not modified by the succession of cyclical transmissions through *G. palpalis*. It thus follows that the resistance of a trypanosome to tryparsamide is preserved intact through three successive cyclical transmissions in *Glossina*. The results obtained from each of the 9 strains may be summarized very briefly as follows:—

1. *Ibongi Cécle*.—A strain of little virulence in man and in monkeys and guineapigs. Transmitted cyclically to a guineapig. The trypanosome in man resisted at least 7 cgm. of tryparsamide per kilo, and in the guineapig 1 gm. of tryparsamide per kilo.

2. *Malanda*.—The trypanosome of this patient, who is an old treated case, proved to be arsenic resistant. After cyclical transmission to the guineapig, the parasite was resistant to 0.5 gm. of tryparsamide per kilo.

3. *Bele Matundu*.—In this patient the resistance of the trypanosome to tryparsamide was 0.12 gm. per kilo. After cyclical transmission the parasite resisted in the guineapig 0.5 gm. per kilo.

4. *Bunga Sakala*.—An old treated case with a slight meningeal reaction. The trypanosome resisted the usual doses of tryparsamide and 1 gm. of Bayer 205. In a mechanically infected guineapig the resistance of the

trypanosomes to tryparsamide was at least 10 cgm. per kilo. and it may well have been more, but the observations were not extended. After cyclical transmission the parasite was resistant up to 0.75 gm. of tryparsamide per kilo.

5. *Zita Kumbi*.—A recent case with a very slight meningeal reaction. The trypanosome resisted in the patient at least 0.16 gm. of tryparsamide per kilo. In guineapigs infected mechanically or cyclically the strain was resistant to doses of 0.6 gm. and 1 gm. of tryparsamide per kilo.

6. *Kindila Lisala*.—In this patient the trypanosome was resistant to the usual dose of tryparsamide, but the strain was non-transmissible with the small number of flies available.

7. *Pota Joseph*.—An old treated case with slight meningeal reaction. The trypanosomes in the patient resisted 6 to 7 cgm. of tryparsamide per kilo, and in mechanically and cyclically infected guineapigs 0.15 gm. to 0.30 gm. of the drug per kilo.

8. *Onema Joseph*.—A very old chronic case treated previously by various methods. The patient had had numerous relapses after well-ordered courses of treatment. The trypanosome was transmitted mechanically to a guineapig and then cyclically to a second guineapig. Its resistance to tryparsamide in the guineapig was very slight, i.e., 0.02 gm. to 0.05 gm. per kilo.

9. *Marcal Joao*.—A resistant strain without meningeal changes. In cyclically infected guineapigs the resistance of the parasite to tryparsamide was only 0.05 gm. per kilo.

From this work the authors conclude that the three characters, (a) cyclical transmissibility, (b) resistance to tryparsamide, and (c) pathogenicity, vary independently of one another. The virulence of drug-resistance has been transmitted intact through *Glossina*.

Observations on the duration of the length of the cycle through *Glossina* in the Leopoldville experiments show that it is shorter than in Entebbe and probably longer than in Nigeria. Among the causes which influence the transmissibility of *T. gambiense*, the age of the infection in the vertebrate host and the nature of the pathological reactions are apparently the most important.

W. Y.

DUKE (H. Lyndhurst). Studies on the Factors that may influence the Transmission of the Polymorphic Trypanosomes by Tsetse. VII. *T. rhodesiense* versus *T. gambiense*: a Comparison of their Power to develop Cyclically in *Glossina*.—Ann. Trop. Med. & Parasit. 1933. Dec. 20. Vol. 27. No. 4. pp. 569-584.

In this paper Duke has examined the power of *T. gambiense* and *T. brucei*, respectively, to develop in *Glossina*. The results of a long series of experiments with each trypanosome are set forth, according to the method usually adopted by Duke, in three tables. The results are summarized in the table which is reproduced on the following page.

The tables show that *T. rhodesiense* is, as a general rule, more readily transmitted by *G. palpalis* than *T. gambiense*. This is interesting, as *G. palpalis* is not the normal vector of *T. rhodesiense*. Whether this superiority will survive repeated cyclical passage through *G. palpalis* is a matter which is now under investigation. There follows a lengthy philosophical discussion on the inferences which can be drawn from this investigation, from which Duke infers that the greater adaptability of *T. rhodesiense* to tsetse suggests reflections on the origin of this trypanosome and its affinities to *T. gambiense* and *T. brucei*—reflections that lend support to the belief that *T. rhodesiense* is in reality *T. brucei* which has overcome man's resistance. The alternative explanation,

Summary of essential data in Tables I, II and III

	<i>T. gambiense</i> 37	<i>T. rhodesiense</i> 21	<i>T. brucei</i> 13
Total no of strains	26 = 71%	21	12
No transmissible . .	11 = 29%	0	1 = 7.6%
No non-transmissible			
Average per cent. of infected flies per strain	In the 35 strains that infected tsetse = 4.4% In the 26 transmissible strains = 4.2%	6.9%	In the 12 that infected tsetse = 4.6% For strains originating from game tsetse region (7) = 4.9%
Average transmissibility index per strain	2.5	4.7	3.0 Of strains from game tsetse region (7) = 3.6
<i>Single tests—</i>			
Total no	64	31	20
No giving more than 10% of infected flies	22 = 34.3%	20 = 66%	11 = 55%
No giving more than 15% of infected flies	9 = 15%	15 = 48%	2 = 10%
No giving more than 20% of infected flies	5 = 8.4%	7 = 22.5%	0

viz., that *T. rhodesiense* is *T. gambiense* which has enjoyed a longer or shorter association with *G. morsitans* instead of with *G. palpalis* is also considered, and stress is laid on the need for experimental examination of this possibility.

W. Y.

DUKE (H. Lyndhurst). **Studies on the Factors that may influence the Transmission of the Polymorphic Trypanosomes by Tsetse. VIII. The Effect of Cyclical Passage through *Glossina*.—Ann. Trop. Med. & Parasit. 1934. Mar. 29. Vol. 28. No 1. pp. 79-91.**

The object of the work described in this paper was to examine the effect of cyclical transmission through *Glossina* on the power of a trypanosome to develop in tsetse. The questions which Duke sets himself are:—

1. Does a single cyclical passage of a feebly transmissible strain through *Glossina* enhance the infectivity of that strain to, or its transmissibility by, tsetse?

2. Does repeated cyclical passage through *G. palpalis* have any such effect?

In his endeavour to answer the first question, Duke used the strain of *T. brucei* originally isolated by HORNBY in Tanganyika, and subsequently sent to Duke by CORSON. CORSON found this strain readily transmissible by *G. morsitans* and *G. pallidipes* after 4½ years maintenance by direct passage through vertebrates. Duke's work on the transmissibility of this strain by *G. palpalis* began a few months later. Subsequently, *G. morsitans* were also used. In the following table Duke summarizes the results and tests applied to this strain with *G. palpalis* and *G. morsitans* before and after a single passage of the strain—the first for some five years—through *G. morsitans*.

		Number of flies dissected	Number containing flagellates	Percentage infected	Number of gland infections	Number of flies alive at 25th day	Number of flies alive at 30th day	Transmissibility index
<i>G. palpalis</i>	Before	1,501	27	1.7	1	12	6	0.1
	After	1,164	25	2.1	1	12	5	0.1
<i>G. morsitans</i>	Before	523	37	7.0	4	17	12	1.6
	After	291	18	6.2	0	5	4	0

As a result of this work, Duke concludes that a single cyclical passage through *G. morsitans* of a strain of *T. brucei*, which had been maintained for five years by direct inoculation from vertebrate to vertebrate, exerted no apparent effect on the power of the strain to develop in *Glossina*.

Details are next given of six strains which were passed cyclically through *G. palpalis*. The general conclusion drawn from this series of observations is that repeated cyclical passage of *T. brucei*, *T. rhodesiense* and *T. gambiense* through *G. palpalis* did not enhance either their infectivity to, or their transmissibility by, this species of tsetse. On the contrary, the majority of the strains so treated underwent a reduction in their power to develop in tsetse.

A certain amount of evidence has been collected which suggests that the individual vertebrate host may exert an influence on the power of a trypanosome to develop in tsetse, this effect being maintained while the trypanosome is in that individual, on removal to a new host by cyclical or direct transmission the power may be fully recovered. The schedule of one of the strains, viz., No. XXXIII *T. gambiense*, suggests that a trypanosome may remain for more than a year in one and the same vertebrate host without suffering any apparent alteration in its power of cyclical development. There are also indications in the schedules that in the calf the transmissibility of a strain undergoes reduction.

W. Y

UGANDA PROTECTORATE. Annual Report of the Human Trypanosomiasis Research Institute for the Year ended 31st December, 1933 [DUKE (H. Lyndhurst), Director].—11 pp. 1934. Entebbe: Govt. Printer. [Sh. 1.]

Apart from two grants for special investigations, the whole cost of maintaining the Institute fell on the Uganda Government during the year ending 31st December, 1933. The actual expenditure amounted to £4,104.

An interesting event during the year was the occurrence of direct transmission of *T. rhodesiense* from antelope to antelope by *Stomoxys* in the antelope quarters. Some information regarding this is given, but the observation will be fully described in a future publication.

In November, the first of what is intended to be a series of Conferences on tsetse fly and trypanosomiasis took place at Entebbe. Many matters of general interest were discussed, and the duty of investigating the prophylactic effects of Bayer 205 against human trypanosomes of man was assigned to the Institute, as was also the continuation of the program already in hand. Dr. Duke and Dr. WALLACE had been in residence during the year. Dr. WALLACE leaves the staff on his departure on leave early this year, and it is expected that Duke will return at the end of the year, after home leave, to complete the outstanding important items on the program of work. A summary of the work done during the year is given. Most of this has already been published elsewhere and received notice in this *Bulletin*.

Some seventeen strains of *T. gambiense*, *T. rhodesiense* and *T. brucei* were examined in respect of their susceptibility to human serum, their natural resistance to arsenicals, the average duration of life in animals infected with the strains and the incidence of posterior-nuclear forms. The three groups were not clear-cut in their characters, but overlapped in some respects, for example, some of the two *rhodesiense* strains were less susceptible to atoxyl than others, and some of the *T. gambiense* strains were somewhat more resistant than the normal.

The red-cell adhesion test—Sixty-two diagnostic tests were carried out on the sera sent to the laboratory by medical officers throughout the Protectorate. Twelve came from cases suspected clinically of trypanosomiasis and of these 3 were positive to *T. gambiense*, 2 to *T. rhodesiense*, and one doubtfully positive to *T. gambiense*. Forty-seven sera came from suspects whose glands and blood were negative and 3 from cases in whom trypanosomes had been found. The former all gave negative, and the last 3 positive, adhesion tests.

Duke has continued his study of the rôle of the antelope as the reservoir of man's trypanosomes. The first part of this study has already been published, and further valuable information will be published in the near future. During the latest stages of the investigation of the infected antelope it became necessary to have direct recourse to man. Twenty-four native volunteers offered their services, all these volunteers were examined before being accepted. Up to the time of writing (21st January, 1934) 11 had become infected, 10 with *T. rhodesiense* and one with *T. gambiense*. In every case treatment either with Bayer 205 or tryparsamide was commenced on the day on which trypanosomes were first found in the peripheral blood; all the patients made an uninterrupted recovery.

In this work, all attempts to infect man and animals were made by the agency of gland infected tsetse. These investigations, details of which will be ready for publication shortly, have, in Duke's opinion, established beyond all reasonable dispute that *T. rhodesiense* may lose its power of infecting man as the result of living for a time in the blood of antelope, and also, apparently, in the course of maintenance, for a year or more away from man, by cyclical passage from monkey to monkey.

A few more cases of *T. rhodesiense* infections in man were detected in the vicinity of Kampala and Masaka. The report closes with summaries of a series of papers published by Duke on the factors that may influence the transmission of the polymorphic trypanosomes by tsetse. All these have already received notice in this *Bulletin*.

W. Y.

WALLACE (J. M.). **The Polymorphic Trypanosomes of Damba Island, Victoria Nyanza. III.—Their Reactions in Laboratory Animals.**—*Ann Trop Med & Parasit* 1933. Dec 20 Vol 27. No 4 pp. 553–567. [11 refs]

This paper records further observations made on three strains of trypanosomes from wild *G. palpalis* caught on Damba Island. It deals with:—

- 1 The length of life of various untreated laboratory animals infected with the strains.
- 2 The effect of human serum on rats and mice infected with two of them.
- 3 The effect of atoxyl on mice infected with the same two strains
- 4 The results of red-cell adhesion tests with trypanosomes and plasmas from animals infected with all three strains.
5. The presence of posterior-nuclear forms.

After recording the length of life of a number of animals infected with the three Damba strains, Wallace compares his results with those obtained by DUKE in 1912 and 1921, with strains of polymorphic trypanosomes from Damba Island. Wallace admits it is difficult to make an exact comparison, but reaches the general conclusion that the present strains appear to be more virulent than those examined in 1912 and 1921.

In a table, the author gives the results obtained by him in his experiments on the effect of normal human serum on mice infected with Strain Damba 3. The results show that in mice this strain is definitely susceptible to 1.0 cc. and to 0.5 cc. of human serum. Strains Damba 2 and Damba 3 were tested as regards their sensitiveness to normal human serum in two series of rats and the results are shown in tables. Both were susceptible to human serum, Strain 3 being rather more sensitive than Strain 2. These results are contrasted with the observations of DUKE in 1912, who found that the Situtunga strain from Damba in rats was unaffected by 1 cc. of normal human serum.

The effect of atoxyl on Strains 2 and 3 in mice was next examined. As a rule, the drug was not given until after the end of the negative period which follows the first appearance of trypanosomes in the blood. Two monkeys infected with Strain 3 were also given atoxyl. The results of these experiments are summarized in tables, and the general conclusion is reached that the strain showed an increased resistance to atoxyl as compared with that of the Damba strains isolated in 1924.

The red-cell adhesion experiment, which is described in detail, demonstrated that there is some affinity between the Damba strain and the three better known polymorphic trypanosomes, viz. *T. gambiense*, *T. brucei* and *T. rhodesiense*, but it is difficult to draw any definite conclusions from this part of the work.

An examination was made of the blood of two rats and one mouse infected with Strain 3 for the presence of posterior-nuclear forms, but none was found.

In conclusion, Wallace considers that the characters of the present-day Damba trypanosomes afford some evidence in support of DUKE's hypothesis that sojourn in antelope may modify *T. gambiense* in the direction of *T. brucei*.

W. Y.

LESTER (H M O) **Report on the Tsetse Investigation.**—*Nigeria Rep. on the Med & Health Services for Year 1932* Appendix B. pp 85-95

Matters discussed are—Effect on trypanosomiasis of cattle of feeding certain minerals and of tartar emetic, study of Nigerian strains of polymorphic trypanosomes, mass examination for sleeping sickness and its large scale treatment

During the year there has been a big increase in the amount of sleeping sickness work done in the field, but laboratory research at Gadau has suffered to some extent through a further depletion of the staff. In 1930, cattle experiments were complicated by the fact that *G. morsitans* in the wet season spread throughout the cattle grazing grounds right up to the station and so infected the controls. In January of this year a complete block clearing was made for about 1,200 yards all around the station, and cattle were kept as close to the station as possible and were not allowed to graze within 500 yards of the savannah.

At the 1931 meeting of the Annual Health Committee, it was decided that experiments should be conducted at Gadau to show the effect on cattle trypanosomiasis of feeding small quantities of the following minerals: (a) sodium bicarbonate; (b) Kanwa (a native alkaline salt), (c) iron, (d) iodine, and (e) iron and sodium bicarbonate. The animals were given the extra minerals for a month, and then inoculated with a double infection of *T. vivax* and *T. congolense*. The disease ran a very rapid course, and within six weeks 55 of the 60 animals used had died. The mortality and course of the disease was similar in all the groups, the small doses of the minerals appearing to have no effect whatever.

Further experiments were undertaken to ascertain the effect of treating with antimony tartrate cattle infected with *T. congolense* and *T. vivax*. The results show that cattle in an advanced stage of the disease and suffering from a double infection derive little benefit from treatment with tartar emetic. Experiments were undertaken to ascertain whether *T. vivax* or *T. congolense* is of the greater economic importance in Nigeria. Ten cattle were infected with each parasite; both strains were obtained from wild *G. morsitans* and had undergone one syringe passage only. At the end of 5 months all the *T. vivax* cattle were dead and all the *T. congolense* animals were alive.

Work on the Nigerian strains of polymorphic trypanosomes has been continued. One strain, Ayu 6, isolated from an untreated case of sleeping sickness in Ayu District, where there is no great quantity of game and no *G. morsitans*, has all the characters ascribed to *T. rhodesiense*. Its virulence was similar to that of many local *T. brucei* strains, and in small animals it showed a high percentage of posterior-nuclear forms. When tested against human serum, all trypanosomes were killed within 3 hours; and it was so resistant to tryparsamide in guineapigs that a dose of about 0.30 gm. per kilo. of body weight was needed to cause the disappearance of trypanosomes from the peripheral blood. Other strains from human cases exhibited all the characteristics of classical *T. gambiense*, whilst still others seemed to occupy an intermediate position. In Lester's view these results afford strong support to the theory that *T. rhodesiense* and *T. gambiense* are really one species, and that the differentiation of African human trypanosomes into two species is artificial and unnecessary.

Observations are being carried out in an endeavour to throw some light on the vexed question of the relationship of the game trypanosome, *T. brucei*, to human trypanosomiasis. The sera of 150 persons (healthy and sick) were tested on a strain of *T. brucei*, but no case was found in which the trypanocidal power of the serum was markedly diminished. The same strain of *T. brucei* was injected subcutaneously into three European and forty African volunteers, but in every instance the result was negative.

Observations have been made which show that virulence of a trypanosome strain may be diminished very greatly by cyclical transmission through *G. tachnoides*.

There has been considerable extension of the system of mass examination of the population for sleeping sickness and of treatment of cases. At the beginning of the year, this work was in charge of two teams, but in September a third team was put into the field. Some 150,808 persons had been examined, and 13,514 cases of sleeping sickness had been diagnosed. Of these 10,620 were given a full course of 24 to 30 gm. of tryparsamide, 872 persons partial treatment, and 1,364 are still under treatment. A further 3,255 cases have been treated at general medical stations.

The position with regard to sleeping sickness in Nigeria is very disquieting, and Lester feels that we are still only touching the fringe of the matter. This year about 7,000 cases of the disease were found in the comparatively small area at the Katagum and Hadejia Survey. When the size of this small area is compared with the whole extent of the country known to be infected, the magnitude of the problem will be realized. In the Plateau Province new surveys were made in the Kaleri district, in the Doka areas of Shendam, and in the Miango and Kwall areas of Jos division; these gave total infection rates of 15.2 per cent., 11.6 per cent., and 11.6 per cent. respectively. In Lafia division, the total infection of the district surveyed was found to be 11.9 per cent., while in the towns of Lafia, Keana and Awe the infection rates were 20.3 per cent., 24.3 per cent. and 30.8 per cent., respectively.

Details are given of the work of the Sleeping Sickness Staff in the field during the year, these comprise the result of examination of the population in a large number of areas and also information regarding the number of sleeping sickness cases treated. Unfortunately, a serious accident occurred at the Kamwai treatment centre of the Pankshin division. After the second injection of tryparsamide, many of the patients became violently ill. Some sank into a state of coma and died from 3 to 7 days later, others became blind, and others recovered completely. In all, 24 patients died, and 35 became blind. As a result of this accident the majority of the infected in this area refused further treatment. The cause of this disaster is thought to be that the solution of tryparsamide was made with hot water instead of cold water. [These catastrophes, which occur from time to time in the use of tryparsamide, are very disconcerting, and it seems very important that they should be thoroughly investigated. VAN DEN BRANDEN has recently been examining the matter (*ante*, p. 207), but although he reached the conclusion that heating a solution of tryparsamide to 70°C., or boiling it, increases the toxicity of the drug, there is nothing in his protocols to satisfy one that the appalling toxicity of the drug in the present instance was due to this cause alone.]

W. Y.

DE MARQUEISSAC Prospections de maladie du sommeil effectuées au Togo de 1931 à 1933, (résultats de laboratoire). [*Laboratory Findings of S.S. Patients in Togo, 1931-33.*—*Bull. Soc. Path. Exot.* 1934. Mar 14. Vol. 27. No. 3. pp. 247-251]

A summary is given of the laboratory findings during examination of gland juice, blood, and spinal fluid of sleeping sickness cases in Togoland, and certain conclusions are drawn therefrom.

HÉRIVAUX and BONNET found in 1927, 1928 and 1929 in the sector of Pagouda an index of gland infection of 10, 12, and 27 per cent., respectively. In 1930, the index had fallen to 4 per cent. In 9 other villages, the most heavily infected of the whole sector, the index of puncturable glands, was 17 per cent. in 1929, and 14 per cent. in 1931, in the same villages the index of gland infections which was 35 per cent. in 1929, had fallen to 9 per cent. in 1933.

The blood infection in these villages appeared to have progressed whilst the gland infection was retrogressing, *e.g.*, 81 per cent. of the cases examined in 1931 had trypanosomes only in the blood, whilst in 1929, 95 per cent. had infected glands. Data of this sort suggest that surveys not based on blood examination of all individuals may give quite fallacious results.

In April, May and June, 1933, 681 lumbar punctures were made of various groups of natives belonging to Sourmdina in the sector of Pagouda. The fluids were subject to the most careful examination, *viz.* the number and type of cells, the quantity of protein (Sicard's method) and the presence of trypanosomes. The following is a summary of the results obtained.—

A. Patients under treatment for more than 4 years and in apparently excellent condition; no trypanosomes in blood or glands.

Number of punctures	..	120	
Altered fluid	..	41	Index 34 per cent.

B. New patients, in good general state, non-somnolent, but with trypanosomes in blood or gland juice.

Number of punctures	...	275	
Altered fluids	...	128	Index 46.5 per cent.

It is remarked that the changes observed in the spinal fluid of this group were limited to a hyperlymphocytosis; no hyperalbuminosis was found.

C. Patients in whom the laboratory examinations were negative (blood and gland juice), but who showed definite clinical signs such as poor general condition or lethargy.

Number of punctures	...	158	
Altered fluids	...	46	Index 29 per cent.

Of these 158 patients 33 were somnolent, but 9 only (27 per cent.) showed a changed spinal fluid. The remaining 125 were in poor general condition, of these 37 (29 per cent.) showed an altered spinal fluid.

The author observes that somnolence can exist without changes in the spinal fluid, but that inadequate treatment may provoke a meningeal reaction, and soon the spinal fluid may show changes. Similarly trauma, accouchement, or an intercurrent disease may cause not only signs of sleeping sickness to appear, but also changes in the spinal fluid in latent cases of the disease. Finally, in occasional instances lumbar puncture itself may provoke a meningeal reaction.

Spinal puncture is essential if one is to decide whether patients who have been under treatment for several years are cured. Moreover, it constitutes an indispensable method of diagnosis, as it alone will

enable the physician to pick out gravely affected patients amongst apparently healthy persons, and it will also give valuable information regarding the type of virus. Hyperlymphocytosis and hyperalbuminosis each has its own significance. A hyperlymphocytosis, especially of the small and medium sized mononuclears, without an excess of protein, indicates a benign virus, whilst a hyperlymphocytosis marked by the presence of large mononuclears, mulberry cells and plasma cells, accompanied by an excess of protein, indicates the presence of a severe virus necessitating special treatment. For the former type the author recommends two series a year of a dozen weekly injections of orsanine, and for the latter repeated series of moranyl-tryparsamide. W. Y.

BARRETT (R. E.). **Notes on the Epidemiology of Sleeping Sickness with Special Reference to Conditions in the West Nile District of Uganda.**—*East African Med J.* 1934 Apr Vol 11 No. 1 pp. 20-28

This paper, which was read at the Meeting of the British Medical Association at Dar-es-Salaam in January, 1934, consists of generalizations on sleeping sickness as it is found in the West Nile District of Uganda. W. Y.

BERNY (P.) Deux cas de récidence dans la maladie du sommeil. [**Two Cases of Second Attack in S.S.**].—*Bull. Soc. Path. Exot* 1934. Mar 14 Vol 27. No 3 pp. 251-253

Details are given of two patients who suffered from a second attack of trypanosomiasis 15 and 8 years respectively after the initial attack. In the periods between the attacks the patients have been carefully examined at regular intervals and there seems no reason to doubt but that they were cured of their initial infections. W. Y.

PALES (Léon). Les surprises de l'autopsie chez quelques trypanosomés. [**The Surprises of the Autopsy in Trypanosomiasis.**].—*Bull. Soc. Path. Exot.* 1934. Feb. 14. Vol 27. No 2. pp. 162-167. With 1 fig.

After asking the question: From what do sleeping sickness patients die? Pales gives an account of the findings at post-mortems in six cases of this disease.

From the protocols, which are given in full, it appears that in the first case there was pronounced tuberculosis of the urinary system, in the second haemorrhagic perisplenitis, in the third a ruptured aneurysm of the descending thoracic aorta, in the fourth an enormously enlarged malignant liver and spleen, in the fifth a trypanosomal meningitis, and finally in the sixth severe icterus.

The author states that if these patients had died in the bush they would certainly have been recorded as sleeping sickness deaths. He recalls that the Report of the Pasteur Institute of Brazzaville (1931) has emphasized the fact that little is known concerning the real cause of death in patients who have once been recognized as infected with trypanosomes. There seems to be no doubt that intercurrent conditions are frequently overlooked and consequently the mortality due to sleeping sickness itself is usually over-estimated. Systematic post-mortem examinations would no doubt decrease the number of deaths now ascribed to sleeping sickness.

In conclusion, the author asks whether there can be any relation between trypanosomiasis and the various conditions found at the post-mortem examination of his six cases. For example: Aneurysm of the aorta is found in syphilitics, can it also result from trypanosomiasis? Had the severe icterus anything to do with the trypanosomiasis with which the patient had been treated? Does arsenical treatment hasten the evolution of cancer of the liver?

These are interesting questions, but it is impossible to answer them

W. Y.

MOUSTARDIER (G.), SICÉ (A.), MERCIER (H.) & VARNEAU. Trypanosomiase humaine latente. [**Latent Human Trypanosomiasis.**].—*Bull. Soc. Path. Exot.* 1934 Apr 11 Vol. 27 No. 4. pp 318–321.

This note gives clinical details of a case of human trypanosomiasis in which the infection lay dormant for a prolonged period. The patient was a native of Haute-Volta. He left Africa on the 27th July, 1931, 4½ months after enlistment, and was sent to La Rochelle, where he arrived on the 9th August, 1931. Apart from indisposition, the result of a sprain, for 21 days during 1932, and an attack of influenza of three weeks' duration at the beginning of 1933, the patient remained in good health. On the 7th September, 1933, he visited a doctor owing to pain in the left side. The doctor noticed definitely enlarged subclavicular glands, and puncture revealed the presence of trypanosomes. No other sign or symptom of the disease was observed.

This case is interesting as the patient had served for 29 months in France, and his service had only been interrupted for a few days on the two occasions mentioned above.

W. Y.

VAN DEN BRANDEN (F.) & APPELMANS (M.). Les troubles visuels dans la trypanosomiase humaine. [**Visual Troubles in Human Trypanosomiasis.**].—*Ann. Soc. Belge de Méd. Trop.* 1934. Mar. 31. Vol. 14. No. 1. pp. 91–107. [20 refs.]

In this paper the authors deal with the incidence and causes of visual troubles met with in human trypanosomiasis.

The authors lay stress on the relative rarity of visual troubles encountered amongst patients in whom the disease has evolved naturally, compared with their relative frequency in treated patients. This is an interesting fact in view of the close relationship of the eyes with the nervous system, of which the retina and optic nerve are merely embryological and anatomical outgrowths. In sleeping sickness, diplopia, paralytic strabismus, and the Argyll-Robertson pupil have not been noted. Only rarely are lesions found in the depth of the eye. MORAX observed only uveitis. Of 418 sleeping sickness patients seen by ROY, only 3 exhibited lesions in the eye, and these consisted of oedema of the papilla; and THIROUX and D'ANFREVILLE observed 4 similar cases. VAN HOOFF has observed optic atrophy in patients who had never been treated. Van den Branden remarks that this absence of ocular symptoms in sleeping sickness is surprising when one calls to mind their frequency in neurosyphilis, in tubercular meningitis, and in acute meningococcal meningitis.

One of the greatest dangers in the treatment of patients in the second stage of sleeping sickness is undoubtedly damaged sight. A

very interesting table is given summarizing observations made on 118 cases in the second stage of sleeping sickness. All the cases were diagnosed by the discovery of trypanosomes either in the gland juice or in the blood. The table shows in each case the weight of the patient before treatment, the pressure of the spinal fluid and its protein and cell content, the total quantity of tryparsamide injected in weekly doses of 2 gm., and, finally, the date of appearance of visual disturbance during treatment. It is remarked that visual disturbances appear suddenly after a variable number of weekly injections of 2 gm of tryparsamide, and that they are often noticed early in the course of treatment. In the present series of 118 cases the sight was infected in no less than 24 patients. This high percentage is, however, not always obtained, as in another group of 69 patients only 5·8 per cent. developed visual disturbance. The ocular troubles are grave, they are manifest regularly in both eyes and often lead to blindness if arsenical treatment be continued. If, however, treatment is interrupted in time, the vision improves and visual acuity may be recovered in great part. Among the authors' patients suffering from ocular complications, reduction of the field of vision to at least $\frac{1}{10}$ th of the normal has been noted, certain patients have become completely blind, others have retained a perception of light, whilst others have been able to count fingers 2 to 3 metres from each eye.

The authors greatly regret that ophthalmoscopic examination of the eyes was not made in their patients. They point out, however, that this has its limitations. The papilla may be very pale as the result, for example, of vascular spasm produced by acute quinine poisoning without damage to the fibres and without loss of vision. Conversely, the vision can be greatly reduced, or even abolished, and the papilla retain its normal appearance, provided the lesions are retrobulbar. What is important is to examine the visual acuity and visual field before the commencement of treatment, and to make sure that there is no change during treatment.

The authors then turn to the question of what causes optic neuritis. They consider in detail three theories. Firstly, that it is due to an excess pressure of the cerebrospinal fluid resulting in stasis of the papillary vessels; secondly, that it is the result of an arsenical intoxication of the optic nerve; and, thirdly, that the toxic neuritis is due to the trypanosomes themselves. Each of these theories is thoroughly examined, and each is in turn dismissed as inadequate to explain the phenomenon. They then advance what they describe as a mixed theory, *viz.*, that the ocular disturbance is due to two different factors, a trypanocidal substance and the trypanosome infected region (*terrain trypanosomé*). It is the arsenicals which are reputed to be neurotropic that are the most efficacious in the treatment of the second stage of sleeping sickness, and it is for this very reason that tryparsamide is at the same time so valuable a drug and so dangerous for the optic nerve, but knowledge on this subject is purely conjectural. Little is known regarding the distribution of metallic arsenic in the different organs, and still less is known regarding the tropism of the arsenicals. We do not know why certain arsenicals containing the same amount of arsenic fail to produce the same visual disturbance. With regard to the second factor, *viz.*, the trypanosome infected region, statistics show that the ocular troubles are especially common in those patients in whom the cerebrospinal fluid is most changed. Among the 118 cases mentioned in this paper

70 had more than 50 lymphocytes per cmm in the cerebrospinal fluid, and 48 had less than 50. Of the former, 21 exhibited visual trouble, and of the latter only 3. There appears then to be a relationship between the gravity of the changes in the cerebrospinal fluid and the frequency of visual trouble.

Summing up their theory, the authors state that the sheath of the optic nerve is a prolongation of the meninges, invasion hence spreads easily from one to the other, giving rise to an optic meningitis. It is not astonishing that this optic meningitis remains latent, because cerebrospinal meningitis itself usually evolves without clinical signs. Optic neuritis, then, has a mixed origin. Involvement of the sheaths, and feeble resistance of the nerve fibres to endotoxins liberated during treatment, and to the arsenicals themselves. The visual troubles are complicated by the formation of fibrous tissue if the lesions are in the tissues of the nerves and of its sheaths.

The article concludes by pointing out the advantages of tryparsamide over atoxyl from the point of view of ocular complications. The chief advantage of the former drug appears to be that if treatment is stopped immediately there is any interference with the acuity of vision, resolution occurs and the sight is recovered, whereas atoxyl often leads to irremediable ocular damage.

W. Y.

ASSOREIRA (Manuel José) Tratamento da doença do sono pelas injeções intra-arteriais de triparsamida. [*Intra-arterial Injection of Tryparsamide in Sleeping Sickness.*]—Reprinted from *Med. Contemporanea*. 1934. Feb. 11. Vol. 52. No. 6. pp. 50-53

In making trial of this form of treatment the author had in view two groups of patients: one, those with ocular symptoms; the other, those who in spite of subcutaneous injections of the drug presented still an abnormal cerebrospinal fluid. He states that he will need some 4-5 months more to complete his study and in this paper records details of five patients belonging to the first group. The drug is injected into the common carotid a little below the level of the hyoid.

In one patient the lesions were of long standing and improvement, though present, was slower than in the other four. The details of one may be given as an example —

A man of 35 years, seen on 16th June, 1931, complaining of headache, drowsiness, weakness and fever. He had some anaemia, was wasted, and had enlarged cervical glands in the juice of which trypanosomes were found. He received 6 injections, altogether 12 gm., of tryparsamide at weekly intervals when visual disturbances arose; treatment was stopped and the patient disappeared till March 1933. At that time he was anaemic, with slight oedema of face and trunk, a vacant, somnolent aspect and with amblyopia. He could see nothing at a distance and near objects were "as if in a thick fog." Subcutaneous injections totalling 16 gm. were given in the next 7 weeks without bringing about any improvement. He then received 2 gm. into the carotid artery. The following day he said he could see better and on the next could distinguish objects perfectly, even at a distance. On the third day he was able to thread a needle. Treatment was persevered with and the improvement was maintained.

In the others the improvement was equally striking and the author states that "in patients with slight lesions of long standing or with severe but recent symptoms, the results of this method of treatment are surprising and are seen as early as the day after the injection. With serious lesions of long standing the action is more delayed, and

the effects may not be noticed till 8 days later, and after a second injection, but are nevertheless, quite obvious" (See this *Bulletin*, Vol. 30, p 783.)
H. H. S

MORA (Damas) L'emploi de la voie intracarotidienne dans le traitement des périodes avancées de la maladie du sommeil. L'action de la tryparsamide, injectée dans la carotide sur les troubles visuels des trypanosomés [Treatment of Advanced Cases of S.S. by the Intracarotid Route. Tryparsamide and Visual Disturbances.] —*Ann. Soc. Belge de Méd Trop* 1934 Mar. 31 Vol 14 No. 1 pp 25-48.

The technique of the intracarotid administration of tryparsamide and other drugs is described, and a summary of the results obtained in certain late cases of sleeping sickness is given.

Preliminary experiments were performed on dogs, into the carotid of which mercurochrome, urotropine, tryparsamide, Bayer 205, and atoxyl were injected. The results of this work suggest that the toxic action of these drugs is not greater when given by the intracarotid route than when given intravenously. Mercurochrome, however, should not be injected into the carotid because it produces dangerous lesions of the central nervous system. Urotropine can apparently be given with safety, as can also Bayer 205. Tryparsamide is tolerated by dogs when given into the carotid in very high doses, and is distinctly less dangerous than atoxyl.

The author then turned his attention to man. In the earliest cases the carotid was exposed before injection, but later a technique was developed whereby it was found that injections could easily be made without exposing the vessel.

The patient is placed on his back on a table with the head lying naturally; if he is in an excited state it is advisable to give an injection of morphia. The face is turned to the side opposite to that of the artery chosen for injection. The doctor always stands on the right side of the patient and feels with the left index finger for the common carotid at the level of the lower border of the larynx and at the anterior border of the sternomastoid. The artery is fixed by the finger against the transverse processes of the cervical vertebrae, or sometimes preferably against the trachea. It is remarked that this is particularly easy in sleeping sickness, because the patients are usually emaciated. After having fixed the artery, the needle is introduced perpendicularly to the surface of the skin along the edge of the finger holding the artery. The needle should be thin, but not too fine, and provided with a short bevel. After piercing the skin it is pushed in slowly in the direction of the artery, until the pulsations of the artery are felt against it, indicating that the tip of the needle is in contact with the wall of the artery. A slight pressure now suffices to penetrate the wall of the vessel, and jets of arterial blood show that the needle is actually in the artery and not in the vein. The sensation of piercing the muscular wall of an artery is moreover so different from that of piercing a vein that a little experience will leave one in no doubt on the matter. The syringe is then attached to the needle and the drug injected slowly into the artery.

It is found that one can inject as much as 3.5 gm. of tryparsamide into a patient of 55 kilograms without any untoward symptoms.

Details concerning the results of treatment of a number of advanced cases of sleeping sickness by this method are then given. The author claims as the result of his experience that the method gives most valuable results. The central nervous system is greatly ameliorated.

The technique is so simple that it can be practised in the bush. Three injections seem to suffice for the production of great amelioration or even apparent cure. The intracarotid route seems to reach certain retreats of the trypanosomes, which are otherwise inaccessible.

The author then passes to a consideration of the action of tryparsamide given by the intracarotid method on patients suffering from visual troubles. A number of observations are recorded on sleeping sickness patients with ocular trouble in whom intracarotid injections of tryparsamide produced rapid and quite unexpected improvement of vision. As the result of his work in this direction, the author concludes that the intracarotid injection of tryparsamide seems to be most useful in the treatment of ocular troubles which manifest themselves in the course of sleeping sickness, provided that hopeless destruction of the nerve tissue has not occurred before treatment. Work is being continued along these lines. W. Y.

SICÉ (A.) Conception actuelle du traitement de la méningo-encéphalite trypanosomique [**Present-day Notions of Treatment of the Nervous Stage of Trypanosomiasis.**—*Marseille-Méd.* 1933. Sept. 5. Vol. 70 No. 25. pp. 253-261.

In this article the author lays down certain general rules for the guidance of those called upon to treat sleeping sickness.

It is easy to-day with the aid of orsanine [Fourneau 270] to cure quickly 98 per cent of cases of human trypanosomiasis, provided the central nervous system is intact, and it is also easy to cure early nervous cases with orsanine or tryparsamide, but the treatment is more prolonged. A single therapeutic agent well given—tryparsamide—suffices to ameliorate the troubles in nervous trypanosomiasis and to effect cure in 78 per cent. of cases. But it must be remembered that tryparsamide is a poor trypanocidal substance, and that notwithstanding its powerful action on the cerebrospinal lesions, it may fail to prevent the reappearance of trypanosomes in the blood. In such cases it is necessary to give other (non-arsenical) preparations, particularly germanin or moranyl.

The author lays great stress on the importance of forming a correct estimate of the state in which a patient is at the time of treatment. He emphasizes once again the value of the information which can be obtained from lumbar puncture. He has already drawn attention to the fact that in trypanosomiasis the nervous system may become involved much more early than was formerly thought possible; in support of this contention he gives details of a case which has recently come under his care. W. Y.

SICÉ (A.), COUSIN (E.) & DANTEC. Recherche de l'arsenic dans le liquide céphalo-rachidien des trypanosomés traités par la tryparsamide. [**Arsenic Content of the Cerebrospinal Fluid of Patients treated with Tryparsamide.**—*Bull. Soc. Path. Exot.* 1933. Dec. 13. Vol. 26. No. 10. pp. 1263-1265.

Examinations were made for the presence of arsenic in the cerebrospinal fluid of natives suffering from the nervous stage of sleeping sickness and who had received varying amounts of tryparsamide. The spinal punctures were performed 6 to 72 hours after the last of a series of intravenous injections of tryparsamide, the last dose was apparently in each case 1 gm.

The 1st group of patients were given a course of 25 gm. of tryparsamide, and the spinal fluid was collected 6 hours after the last injection. The 2nd group were also given 25 gm. of the drug, but spinal puncture was performed 24 hours after the last dose. In the spinal fluid of both these groups the presence of arsenic was detected, but in amounts too small to estimate. Similar results were obtained in a 3rd group who had received 32-35 gm. of tryparsamide and in whom spinal puncture was performed 30 hours after the last dose.

No trace of arsenic was discovered in the spinal fluid of a 4th group of patients who had been given 53 gm. of tryparsamide, and in whom spinal puncture was performed 48 hours after the last injection, nor in the fluid of a 5th group collected 72 hours after the last dose of a course of 72 gm.

Apparently the presence of arsenic in the spinal fluid is very transient and the drug can be detected only within the first 24 hours following an intravenous injection of 1 gm. W Y

VAN DEN BRANDEN (F) & DUMONT (P) Contribution à l'étude de la stabilité de la glyphenarsine (tryparsamide) [**Study of the Stability of Tryparsamide.**]*—Ann. Soc. Belge de Méd. Trop.* 1933. Dec. 31. Vol. 13. No. 4. pp. 451-454.

The question of the stability of tryparsamide is considered, and, in particular, whether the drug changes as the result of exposure to a moist atmosphere over prolonged periods.

The changes which are found to take place in "914" have given rise to some uneasiness in respect of tryparsamide. The authors, however, are satisfied that there is no need for anxiety on this score. Tryparsamide is a stable compound and its composition is well defined, different samples from the same source are similar as are also samples from various sources. The rose colouration which is sometimes seen is not due to a change in the drug itself, but to changes in impurities in the drug. It is not possible to increase the density of the colouration by exposing the drug for longer periods to various atmospheric conditions.

A quantity of tryparsamide, which had remained unchanged for 2 years, was placed for 3 months in a petri dish inside an incubator at 37°C., the atmosphere of which was kept saturated. At the end of this time there was a distinct yellow colour, but examination of the drug showed that all its properties—physical, chemical and therapeutic—were unchanged, and that the only alteration was a slight increase in toxicity [see also this *Bulletin*, Vol. 30, pp. 786 & 787]

W. Y.

SPYROU. Trypanosés-arsénorésistants et fortes doses de tryponarsyl. [**Arsenic-Resistant Patients and Strong Doses of Tryponarsyl.**]*—Ann. Soc. Belge de Méd. Trop.* 1933. Dec. 31. Vol. 13. No. 4. pp. 435-446. With 1 map.

Details are given of the results obtained in the treatment of arsenic-resistant cases of sleeping sickness with various doses of tryponarsyl.

The observations were made in the Tshela-Est district, which is situated near the centre of the Mayumbe Belge. The disease is distributed throughout the district and is of special interest in view of the fact that for some time it has been resistant to arsenicals. The

author defines arsenic resistance as a state in which trypanosomes persist in the peripheral blood and glands, notwithstanding adequate arsenical treatment. Two groups of resistant cases are met with—a first in which the trypanosomes are resistant to the first course of treatment, and a second in which the initial treatment causes their disappearance, but relapse soon occurs.

The first cases of arsenic-resistance in Tshela-Est were found in 1929, and since then they have become ever more numerous until in certain places they now form 55·2 per cent. of the total cases. The results of treating with tryponarsyl a number of resistant cases are given in detail. The first series consisted of 8 patients previously treated with small doses of tryponarsyl (0·03 gm. to 0·047 gm. per kilo.), these patients were given large doses of the drug, but the infection remained uninfuenced in all cases.

The second series consisted of previously untreated cases and they were given large doses of the drug. The results were distinctly better, in 7 of the 11 patients the peripheral blood and glands weresterilized, but in 4 the infection proved to be completely resistant. W. Y.

VAN HOOF (L.). Un nouveau dérivé antimonie organique, le Dn 18, dans la trypanosomiase humaine. [A New Organic Antimonial Derivative, Dn 18, in Human Trypanosomiasis.]—*Ann. Soc. Belge de Méd. Trop.* 1933. Dec. 31. Vol. 13. No. 4. pp. 479-493.

The therapeutic value of the new antimonial preparation Dn 18 of the Union Chimique Belge has been tested on a number of cases of sleeping sickness. It is considered to be a valuable remedy.

This preparation is a complex trivalent compound [this *Bulletin*, vol. 30, p. 788, and vol. 31, p. 210]. Solutions can be kept for at least 24 hours, but they must not be sterilized by heating. It is important to note that for the injections glass syringes with platinum or nickel needles must be used, as steel causes changes in the drug; they can be given intravenously, intramuscularly, or subcutaneously, as the substance is non-irritating.

A single intravenous injection of 0·5 gm produced peripheral sterilization as determined by gland puncture, or triple centrifugation of blood, within probably about 7 minutes, but in all cases relapses occur after periods varying from 7 to 72 days. In determining the dosage which can be safely used in man, the author began with intravenous injections of 0·25 gm. and 0·5 gm. and advanced cautiously up to 0·75 gm. This seemed to be the limit, because although it was well tolerated by some cases, in others it produced nausea, vomiting and syncope. No intolerance was observed in patients who were given a series of injections of 0·5 gm. twice weekly. The drug appeared to be non-cumulative and the toxic dermatitis seen after the use of Dn 12 was not observed with Dn 18. As much as 10 gm. could be given in this way without producing the least trouble.

The results of treating a number of cases are set forth in detail. The patients are divided up into small groups according to whether they were treated with Dn alone, whether they had previously been given other drugs, or whether Dn was given in association with other drugs. In two cases the drug was given intrathecally, and finally it was tested on two patients who had proved resistant to tryparsamide.

Summarizing the general results obtained, it appears that Dn 18 is remarkable for the speed with which it produced peripheral sterilization (7 minutes) and for the length of the periods of sterilization

produced by a single dose, *viz.*, 7 to 72 days. It has constant and uniform trypanocidal activity which is not exhibited by Dn 7, Dn 9, or Dn 12. The tissues of the host exhibit great tolerance to the drug, and apparently it has a non-cumulative action, so that prolonged and intensive courses can be given without toxic results. It has a definite curative value in advanced cases of the disease, this is shown by modifications in the cytological and chemical changes of the spinal fluid and by clinical improvement of the patients.

It is of great value when used in association with other trypanocidal substances. In respect of this, however, the author writes that, notwithstanding some very good results obtained by mixed treatment of germanin, tryponarsyl and Dn 18, he does not recommend the adoption of this mode of treatment as a general rule.

Experience of the treatment of large numbers of cases at Leopoldville has shown a much greater frequency of optic atrophy as the result of tryparsamide plus germanin than from tryparsamide alone. The author considers that germanin in large doses has an irritative action on the meninges, this is shown by an increase of lymphocytes and by the appearance of large mononuclears, and by a notable increase in the amount of protein in the cerebrospinal fluid. It is quite possible that this explains the increase of sensitiveness of the optic nerve to arsenicals.

Finally, the efficacy of Dn 18 in typical cases of arsenic resistance makes the drug a valuable remedy in these difficult forms of the disease.

W. Y.

SMYTHE (C. V.) & REINER (L.). **Toxic Effect of Sodium Monoiodoacetate on Trypanosomes.**—*Proc Soc Experim Biol & Med* 1933. Nov. Vol. 31. No. 2. pp. 289-292. [15 refs]

The authors have studied the trypanocidal action of sodium monoiodoacetate both *in vitro* and *in vivo*.

In vitro experiments showed that a 0.001 M solution killed *T. equiperdum* in from 2 to 3 minutes. Preliminary experiments on 14 rats showed that the maximum tolerated dose of sodium iodoacetate injected intravenously into a normal 240 gm. rat is 0.2 cc. of a 0.25 M solution. Subcutaneous and intramuscular injections gave approximately the same results. When this dose was injected into a rat infected with *T. equiperdum*, the blood became free from trypanosomes within 2 to 3 hours. A number of the infected animals died sometimes after the trypanosomes had disappeared from the blood. This suggested to the authors that the infected animals were somewhat more sensitive to the drug than normal rats. The blood remained free from trypanosomes for from 2 to 10 days. A second dose cleared the blood for about the same length of time, and the treatment has up to date been repeated seven times and the animals are apparently in good health, with the exception of some inflammation and soreness at the place of injection.

The authors remark that there are differences in the action of iodoacetate and of arsenicals. Thus, the action of the former could not be prevented either *in vitro* or *in vivo* by the addition of sulphhydryl in the form of cystein or thiosulphate solution, whereas arsenicals were detoxified in analogous experiments. Further experiments showed that an arsenic resistant strain of trypanosomes is just as sensitive to iodoacetate as is the normal strain.

W. Y.

MONCORPS (C) & BOHNSTEDT (R M). Ueber den Einfluss des reduzierten Glutathion auf die kurative Neosalvarsanwirkung bei der naganakranken Maus. [The Influence of Reduced Glutathione on the Curative Action of Salvarsan in Nagana Infected Mice.]—*Arch f. Dermat u Syph.* 1934. Apr. 20 Vol 170. No 1 pp 26-32 With 3 figs.

In this investigation the authors have inquired whether glutathione has any action on trypanosomes *in vitro*, whether it influences the course of nagana infection in mice, and finally whether it in any way interferes with the result of treating nagana-infected mice with salvarsan. As the result of their experiments they found:—

1. That in nagana infected mice the incubation period was shortened, and death occurred more quickly, when the infected blood was mixed with glutathione before injection

2. That the previous treatment of a trypanosome suspension with a mixture of glutathione and salvarsan produced a more rapid infection than did a suspension of trypanosomes treated only with salvarsan

3. *In vitro* the motility of the trypanosomes was lengthened by the addition of glutathione, and the inhibitory action of salvarsan was destroyed by it.

4. In nagana-infected mice the trypanocidal action of neosalvarsan was sometimes increased and sometimes inhibited by the simultaneous administration of glutathione, according to the quantity given and to the method of its administration.

IV. Y.

HAWKING (Frank) The Absorption of Acriflavine by Trypanosomes. —*Ann Trop Med & Parasit.* 1934. Mar. 29 Vol. 28. No 1 pp 67-77. [10 refs]

The author has examined the capacity of normal and atoxyl resistant strains of *T. rhodesiense* to absorb acriflavine. This drug was chosen because its chemotherapeutic actions *in vitro* and *in vivo* closely resemble those of trivalent arsenicals, and because the brilliant green fluorescence, which it exhibits in dilute solution, promised a simple method of quantitative estimation.

This investigation was inspired by the previous work of YORKE, MURGATROYD and HAWKING (this *Bulletin*, Vol. 28, p 910), who showed that whereas a normal strain of trypanosomes rapidly absorbs a trivalent arsenical compound, an atoxyl resistant strain fails to absorb any appreciable quantity of the drug. This observation is of considerable academic importance in that whilst it is in harmony with EHRLICH's explanation of the mechanism of drug resistance, it appears to render untenable the hypothesis of VOEGTLIN, DYER and MILLER.

Hawking's experiments, which are given in detail, show that when normal trypanosomes are suspended in a solution of acriflavine they absorb practically the whole of the drug from the medium, and from the deposit of trypanosomes it is possible to extract measurable quantities of the drug. When, however, atoxyl resistant trypanosomes are exposed to similar concentrations of the drug, they remove only small quantities from the medium.

Experiments show that the absorption of acriflavine by normal trypanosomes occurs very rapidly both at 37°C. and 16°C. Information is also supplied regarding the maximum quantity of acriflavine which can be absorbed by a given number of trypanosomes.

Somewhat comparable observations were made on infected mice. These show that if mice heavily infected with the normal strain are

injected with acriflavine and killed by exsanguination half an hour later, measurable amounts of the drug can be extracted from the trypanosomes. In similar experiments with mice infected with the atoxyl resistant strain no appreciable amount of acriflavine could be so extracted
W. Y

STEUDEL (Emil). Wie bewahrt sich Bayer 205 als Heilmittel gegen die Schlafkrankheit? [The Curative Value of Bayer 205 in S.S.] —*Muench. Med. Woch.* 1933. Dec 22. Vol. 80. No. 51. pp. 2009–2011.

Steudel summarizes the various publications which have hitherto appeared relating to the value of Bayer 205 in the treatment of sleeping sickness. All these papers have already received notice in this *Bulletin*.
W. Y

CORSON (J. F.). A Further Note on the Action of Normal Human Blood-Serum on *Trypanosoma rhodesiense* in Relation to Cyclical Passage through Tsetse Flies.—*Jl. Trop. Med. & Hyg.* 1933 Dec 15. Vol. 36. No. 24. pp. 378–379.

The experiment described in this paper was performed with the object of ascertaining whether increased susceptibility to human serum in a strain of *T. rhodesiense* was transmitted through tsetse flies.

A number of white rats and four guineapigs were infected by inoculation with the blood of a patient suffering from a recent infection of *T. rhodesiense*. Laboratory-bred *G. morsitans* were fed on the guineapigs, and the infection cyclically transmitted to white rats. The rats infected by inoculation from the patient's blood, and those infected from the guineapigs by the flies were injected with normal human serum. The results are given in a table, which shows that the increased susceptibility to human serum caused by passage of the strain through guineapigs was transmitted by *Glossina*, unless, as is possible, it was acquired in the flies.
W. Y.

CORSON (J. F.). Direct and Cyclical Transmission of *Trypanosoma rhodesiense* through Guinea-Pigs. A Comparison of the Reaction to Normal Human Serum.—*Jl. Trop. Med. & Hyg.* 1934 Apr. 16 Vol. 37. No. 8. pp. 113–114.

Although it has not been proved by experiment, and perhaps cannot be proved, it seems very probable that the trypanocidal action of normal human blood serum or plasma, is also a property of the circulating blood of man and plays some part in his resistance to infection with trypanosomes. Consequently, it is of considerable interest to know whether the reaction to human serum of *T. rhodesiense* in lower animals is affected by cyclical transmission.

ADAMS [this *Bulletin*, vol. 30, p. 768] and FAIRBAIRN [tom. cit., p. 767] using *in vitro* technique, have shown that in recently isolated strains of *T. rhodesiense* the proportion of resistant trypanosomes decreases in the course of successive mechanical transmissions through small laboratory animals; and the former found that in guineapigs a definite loss of resistance occurred in three strains of *T. rhodesiense* after a single cyclical transmission by tsetse flies (*G. palpalis*). On the other hand, experiments *in vivo* with rats and guineapigs by the

author [*ante*, p. 201] indicated that cyclical passage through *G. morsitans* did not restore resistance to human serum that had been diminished by direct passages

Corson, in his present work, inoculated a guineapig with the blood of an infected man and carried on one branch of this strain through guineapigs by direct inoculation, and the other by cyclically infected fly as is shown in the following scheme —

Man — G P 95 = Fly = G.P 124 — G P.142	$\left\{ \begin{array}{l} = \text{Fly} = \text{G.P.172} = \\ \text{Fly} = \text{G.P.195} \\ - \text{G.P.158} - \text{G.P.187} \end{array} \right.$
24.7 33.	

On 19th January, 1934, 15 rats were inoculated from Guineapig 195 of the fly transmission series and 15 rats from Guineapig 187 of the direct transmission series. The weight of each of these rats was about 90 gm., and when their peripheral blood showed a moderate infection of 10–50 trypanosomes per microscope field, each was inoculated subcutaneously with 2 cc. of normal human serum. The results, which are set out in a table, suggest that, so far as man's resistance to infection with *T. rhodesiense* may depend on the trypanocidal action of his blood, he would not be less resistant to infection with trypanosomes transmitted cyclically from animal to animal for a given period, than if the passages were by mechanical transmission

W. Y.

CORSON (J. F.) **Infection of the Cerebro-spinal Fluid of an Antelope with *Trypanosoma rhodesiense*.**—*Ann. Trop. Med. & Parasit.* 1934 Mar. 29. Vol 28 No. 1 p 141.

Laboratory-bred *G. morsitans* were infected from a guineapig inoculated from the blood of a Rhodesian sleeping sickness patient, and the salivary glands of two infected flies were inoculated into a dik-dik. Two months later the dik-dik died and a few minutes after death the cerebrospinal fluid, free from red blood corpuscles, was obtained by suboccipital puncture. There were 4 trypanosomes and 400 leucocytes per cubic millimetre of fluid. The blood of the dik-dik contained numerous trypanosomes, and post-mortem examination showed no cause for death. Corson adds that this antelope is very susceptible to infection with *T. rhodesiense*, but it is not yet known whether the infection is always followed by death within a period of time which would indicate that the infection was the cause of death

W. Y.

CORSON (J. F.). **Latent Infection of *Trypanosoma brucei* in a White Rat.**—*Jl Trop. Med. & Hyg.* 1934. Jan. 1. Vol. 37. No. 1. pp. 11–12.

After referring to the fact that THOMSON and ROBERTSON (1926) had shown that *T. gambiense* inoculated from man into rats may cause a latent infection of at least six months' duration, and that a similar latent or chronic infection of *T. rhodesiense* may follow the treatment of an infected rat with a single dose of tryparsamide, Corson gives details of an example of latent infection in one of a number of white rats infected by him with a strain of *T. brucei* obtained from a Zululand donkey.

The rat in question was inoculated from a dog on October 13, 1932. Its blood was examined frequently between this date and March 21,

1933, but no trypanosomes were discovered. In February, 1933, it had a litter of young, none of which was infected, and again in June, 1933, it gave birth to a single young one. On June 24th, the animal was noticed to be ill, and the blood was found to be swarming with trypanosomes morphologically identical with *T. brucei*. The rat died 254 days after inoculation. Corson notes that accidental infection of the animal can be excluded.

Details of a large number of rats inoculated with this strain are given in a table, from which it is seen that the parasite had an unusually low virulence for white rats. Several rats in fact failed to become infected, as did also guineapigs inoculated with the strain. The strain was, however, infective for dogs and rabbits. On October 5, 1932, four European volunteers were inoculated subcutaneously with the blood of a dog which contained numerous trypanosomes at the time, they have shown no signs or symptoms of the infection.

W. Y.

CORSON (J. F.) **A Further Note on a Strain of *Trypanosoma brucei* from Zululand.**—*Jl. Trop. Med & Hyg.* 1934. May 15. Vol. 37 No. 10. pp. 152-153.

This paper records further observations on the strain of *T. brucei* from Zululand. In his previous paper, Corson had drawn attention to the fact that infected rats live, in the earlier passages, usually for periods of from 60 to 200 days, and that in the case of one rat the infection remained latent for no less than 9 months. Six rats sub-inoculated from the blood of this rat shortly before its death all became infected and died in from 13 to 19 days. This increased virulence was maintained in subsequent direct passages in rats, thus clearly marking off this branch of the strain from the rest and giving a picture similar to that of a virulent strain of *T. rhodesiense*. Guineapigs could now also be infected. The strain had previously failed to infect them. As it has been suggested that cyclical passage modifies polymorphic trypanosomes by stabilizing their virulence or removing acquired characters, it was decided to pass the strain through *G. morsitans* and to observe whether this passage affected the recently acquired virulence. Laboratory-bred *G. morsitans* were fed on a guineapig which had been inoculated from an infected rat of the virulent branch of the strain. Two infected flies were isolated; one was fed on the author, and subsequently on a series of rats, and the other infected fly was fed on rats. The author did not become infected, but all the rats did, and all developed an acute infection. Apparently, therefore no loss of virulence occurred as the result of cyclical passage.

W. Y.

KONNÉ (M.) & PIERAERTS (G.). **Obtention, à partir d'un *Trypanosoma rhodesiense* polymorphe, d'une souche sans noyau postérieur. [Loss of Posterior Nuclear Forms in a Strain of *T. rhodesiense*.]**—*Bull. Soc. Path. Exot.* 1933. Dec. 13. Vol. 26. No. 10. pp. 1261-1263.

Both of the two guineapigs in which a strain *Brucei-pecaudi* was being maintained were found dead one morning; in an attempt to

recover the strain a number of mice were injected with the blood obtained from the lungs and heart. After a prolonged incubation period of three weeks one of the mice was found to be infected. The curious fact was observed that, although the original strain was pronouncedly polymorphic, many of the short forms exhibiting a posterior nucleus, the recovered strain no longer exhibited this polymorphism.

An attempt was then made to repeat this observation on a strain of *T. rhodesiense* recently isolated from man. This attempt failed, and the authors then decided to try the effect of infecting rats with single trypanosomes by means of Oehler's capillary tube method. In the first two series of experiments, comprising respectively 10 and 15 rats, none of the animals became infected, but in the third 2 of 10 rats became infected. One of these developed the usual polymorphic type of infection, but the other developed an infection in which it was impossible to discover posterior-nuclear forms. Sub-inoculations of the latter strain through a series of 15 rats likewise failed to produce posterior-nuclear trypanosomes. Generally speaking, the long forms considerably predominated, only a few medium and short forms being seen. Attempts to make this strain polymorphic again and to cause the reappearance of posterior-nuclear forms, by administering small doses of Bayer or tryparsamide, and by transferring the strain into guinea-pigs, failed.

In an attempt to explain the phenomenon, the authors remark that it is well known that strains of *T. rhodesiense* passaged through laboratory animals tend gradually to lose their posterior-nuclear forms. They suggest that certain individuals lose their power to produce these forms long before others do so, and that their strain had arisen from such a trypanosome.

W. Y.

CULBERTSON (James T.) The Trypanocidal Action of Human Serum : the Relationship between the Trypanocidal Action of the Serum and Man's Immunity to the Trypanosomes Pathogenic for Animals.
—*Ann. Trop. Med. & Parasit.* 1934. Mar. 29. Vol. 28. No 1.
pp. 93-97. [12 refs.]

The object of the work described in this paper was to ascertain the effect of human serum upon infections in rats with *T. lewisi* in an effort to relate the trypanocidal activity of human serum to man's immunity to the trypanosomes which infect animals.

The results of the experiments, which are summarized in a table, furnish no evidence that human serum when injected into rats in doses of 3 cc exerts a prophylactic effect upon the *T. lewisi* infections. The first attempts to demonstrate the therapeutic effect of the serum upon *T. lewisi* were made at a time when the parasites were in a stage of rapid multiplication; the serum had no effect upon the parasites, which continued to multiply. The results of the second attempt are, however, less clear cut, since one rat was free from parasites one day after the injection of serum, but it seems probable that this was a *post hoc* and not a *propter hoc* phenomenon. These experiments, in the author's opinion, provide additional evidence that man's immunity to the species of trypanosomes, which naturally infect animals, is based on factors other than the trypanocidal activity of the human serum.

W. Y.

SCHILLING (Claus), assisted by the late H SCHRECK, H NEUMANN & H KUNERT **Immunization against Trypanosomiasis.**—*Jl Trop Med & Hyg* 1934 Mar. 1 Vol. 37 No 5 pp 70-72

The paper is substantially the same as two papers previously published by these authors [*ante*, p 213] Experiments on the two foals "Zeus" and "Lottchen" are again described in detail

Another line of work described in the present paper was to transmit extremely few trypanosomes from an animal carrying a labile infection with the object of producing the same infection in a calf. That this is possible has been demonstrated in a foal and six calves. In the latter animals the infection may be so feeble that the trypanosomes cannot be found in the blood and the temperature does not rise above 40°C, nevertheless, after 57 days the presence of trypanocidal antibodies could be demonstrated in the blood In the case of the foal "Erna," which was inoculated with 5 cc of the blood of the foal "Lottchen," containing extremely few trypanosomes, the temperature became irregular for a few days only The weight rose from 65 to 140 kg, but trypanosomes were nearly always present in the blood. Five months later (Sept., 1932) this foal was bitten by *G morsitans* infected with *T congolense* and *T brucei* Although a week later both parasites were demonstrable, only *T brucei* continued to multiply The animal was subsequently treated with antimosan

In the author's opinion, the inoculation of this foal with "Lottchen's" blood had set up a labile infection which prevented *T. congolense* developing when these were inoculated by flies. W. Y.

RAFFEL (Sidney) **Studies in Immunity to Trypanosomes. I. Acquired Immunity in *Trypanosoma equiperdum* Infected Rats. The Rieckenberg Reaction.**—*Amer Jl Hyg.* 1934. Mar Vol. 19. No. 2. pp. 416-448 With 1 diagram & 3 graphs. [43 refs.]

This paper is the first of a series recording the results of investigations carried out on the immunology of trypanosome infections in the rat

It opens with a somewhat lengthy summary of the work of previous investigators on the subject. As a result of his examination of the literature, the author points out that immunity reactions are so exceedingly delicate that they distinguish between different strains of the same parasite and are consequently of no value for the identification of trypanosome species. In support of this he quotes the well-known observation of HARTMANN (1930), who isolated 3 relapse strains of *T. brucei* by means of rabbit inoculations. He then injected the original strain into the scrota of normal rabbits and superinfected at other points with the relapse strains. Primary chancres were obtained at all the sites of inoculation, whereas if superinfection was done with the original strain the animals developed no chancres at the points of superinfection [see this *Bulletin*, Vol. 27, p. 851].

The author commenced his investigations by studying experimental infections of *T equiperdum* in the rat. When these animals were infected with large numbers of trypanosomes the disease ran an acute course and the rats died in 4 or 5 days. When, however, small infective doses were given, relapsing types of infections were obtained. Details of these experiments are given in a table. The development of immune bodies in these infections was studied, as was also the development

of the "Rieckenberg" antibodies, which were elaborated at the trypanocidal crises. Among other points of interest brought out by these infections was the fact that these antibodies were found present in a fraction of the blood other than the fibrinogen to which they have been previously ascribed. The author gives the following summary of his work —

"1. With ordinary heavy infective doses of *Trypanosoma equiperdum* in rats an acute blood infection is obtained, with death occurring in from three to seven days after infection. The length of life is dependent upon the size of the infective dose, and probably to some extent on the weight of the animal employed.

"2. With small infective doses of organisms the rat may show an immunity to the parasites. Immunity occurs in the majority of animals given these small numbers of organisms, and antibodies may be produced several times during the course of an infection. The invariable result, however, is a fatal relapse. This finding is contrary to the results reported by previous investigators, who have described the infection with virulent *T. equiperdum* in this animal as always being acute in nature.

"(a) Immunity may be produced to the original infecting strain before organisms have appeared in the blood stream at all in microscopically demonstrable numbers. Antibodies may also be formed during the periods following visible crises against the relapse strain resulting from such a crisis

"(b) The immunity is strictly strain specific.

"(c) The first relapse strains of the same original strain are the same in different rats.

"3 Subinfective doses of living trypanosomes do not cause the production of immunity in this animal. Since the parasites comprising subinfective doses are most probably killed by the natural resistance powers of the host very soon after introduction into the body, the conclusion is drawn that immunity to trypanosomes in this animal is dependent upon the presence of living parasites, even if only as a latent infection.

"4 Investigation of the Rieckenberg or "thrombocytoharin" antibody has revealed it to be associated with the globulin fraction of the serum. Previous reports have for the most part assigned this antibody to the fibrinogen of the plasma.

"(a) The antibody may be demonstrated in this fraction by the addition of non-specific particulate elements, such as bacterial vaccines or the normal whole bloods of various animals, to the test.

"(b) In view of the fact that the antibody is found in association with the same protein of the blood as other known antibodies, it is suggested that from the viewpoint of the essential identity of antibodies, this one is only one manifestation of the fundamental immunity response of the host to the parasites."

W. Y.

SCHWETZ (J.). L'influence de la splénectomie sur l'évolution des trypanosomes pathogènes (*Tr. gambiense* et *Tr. congolense*) chez les rats et les souris. [Influence of Splenectomy on the Development of Pathogenic Trypanosomes in Rats and Mice.]—*Bull. Soc. Path. Exot.* 1934. Mar. 14. Vol 27. No 3. pp. 253-260

Experiments were undertaken to ascertain the effect of splenectomy on trypanosomal infections in rats and mice.

It was found that splenectomy did not render the rodents susceptible to infection with *T. vivax*. Similarly, splenectomy exercised little

effect on the susceptibility of these animals to *T. gambiense*, but as a rule its effect on their susceptibility to *T. congolense* was more pronounced
W. Y.

ARNAUD Procédé nouveau de culture de "*Trypanosoma gambiense*" sur milieux artificiels. [New Method of culturing *T. gambiense*].—*Ann. Soc. Belge de Méd. Trop.* 1934 Mar 31. Vol. 14 No. 1. p. 1.

Recently PAGNIEZ (1932) has drawn attention to the curious properties of human and ox serum treated for two minutes with ether. The author has inquired whether this procedure will not remove from human serum its property of inhibiting the growth *in vitro* of *T. gambiense*.

A quantity of human serum was shaken for two minutes with an equal volume of ether, and after allowing the fluids to separate by standing, the serum was removed and mixed with twice its volume of Ringer-Locke solution, and sterilized by filtration. Flasks containing 50 cc. of this medium were then inoculated with 10 or 12 drops of the blood of a guineapig heavily infected with trypanosomes. In 4 to 12 days a good culture was obtained, and this was easily carried on by subinoculation.
W. Y.

VAN HOOFF (L.). Immunité et guérison spontanée de singes cerco-pithèques infectés par *Trypanosoma gambiense*. [Immunity and Spontaneous Cure of Cercopithecus Monkeys infected with *T. gambiense*].—*Bull. Soc. Path. Exot.* 1934. Feb. 14. Vol. 27. No. 2. pp. 167-169.

Spontaneous cure is apparently rare in human trypanosomiasis, the author has encountered only a single instance of this, and DYLEFF has reported a few others. [Some years ago the reviewer searched the literature for records of such cases, and the result of his efforts are summarized in this *Bulletin*, Vol. 18, p. 155.] During his work on the transmission of drug resistant trypanosomes van Hooft encountered a number of cases of spontaneous cure and immunity in his experimental monkeys. Details of three such cases are given

Monkey XX was injected on 20 March, 1933, with the salivary gland of a tsetse heavily infected with trypanosomes resistant to tryparsamide. The fly had been infected on a patient, and the trypanosome resisted in guineapigs at least 0.5 gm. of tryparsamide per kilo. The monkey showed trypanosomes for the first time on 29 March and its blood remained positive until 12 June, 1933. Trypanosomes then disappeared and were not found afterwards. The animal remained in good health until the end of August, when it died of dysentery. At the post-mortem no evidence of trypanosomiasis was found.

Monkey I was inoculated on 14 Jan., 1932, with arsenic resistant trypanosomes (*T. gambiense*) from a guineapig. Its blood became positive on 29 Jan., and was thereafter irregularly positive until 1 March, 1932, when trypanosomes were found for the last time. The animal was kept under constant observation until 24 April, 1933, and so far as could be ascertained was free from infection. In order to see if it were immune massive injections of resistant trypanosomes were injected on 24 April, 9 June, 3 July and 17 July, 1933. The animal proved to be absolutely refractory.

Other similar cases have been observed by the author. W. Y.

KUNERT (Herbert) & KUNZMANN (Theo). Die Beziehungen zwischen Trypanosomeninfektion und Blutrhodangehalt [The Relationship between Trypanosome Infection and the Blood Sulphocyanate Content.]-*Arch. f. Schiffs- u. Trop-Hyg* 1934 Apr. Vol. 38. No 4 pp. 159-170 [17 refs]

Estimations of the sulphocyanate content have been made on the blood of a series of animals at various stages of trypanosomal infections.

The occurrence of sulphocyanate in the human and animal body has been recognized for a long time, and the phenomenon has been studied both in health and in disease. A summary of this work is given. Through the work of SULLIVAN and DAWSON (1921) and others we know that sulphocyanate is formed during the metabolism of proteins, and that this is due to the action of a ferment, Rhodanese. It is believed that sulphocyanate must be a regular constituent of the body.

In their own experimental work the authors used the colorimetric method first described by LOCKEMANN and ULRICH (1931) for the estimation of sulphocyanate in the gastric juice. Preliminary investigations showed the amount of sulphocyanate in the blood of normal horses and goats to vary from 0.05 to 0.5 millinormal (= 0.29 mgm. per cent. and 2.9 mgm. per cent.) and of calves and dogs from 0.005 mn. to 0.05 mn. (= 0.029 mgm. per cent. and 0.29 mgm. per cent.). The result of estimation of the sulphocyanate blood content in a series of these animals infected with *T. congolense* and *T. brucei* is given in a number of tables. It was found that these infections in all the animals produced a rise in the sulphocyanate blood content. This increase is the expression of an increased destruction of protein due to the trypanosomal infection. The sulphocyanate blood content is independent of the temperature and of the intensity of the blood infection, and it is not influenced by adrenalin. It varies during the course of the infection and may fall to very low values shortly before death. Similarly it falls to normal after the animal is definitely cured, but after an incomplete cure the fall is merely transient. In such cases a subsequent rise of the sulphocyanate titre signifies a relapse of the infection even though this may not be manifest from blood examination.

W. Y.

PENSO (Giuseppe). Sul ciclo di sviluppo del "Trypanosoma gambiense" negli ospiti vertebrati [The Developmental Cycle of *Trypanosoma gambiense* in the Vertebrate Host.]-*Ann. di Med. Nav. e Colon.* 1934. Jan.-Feb. 40th Year. Vol. 1 No. 1-2. pp 25-77. With 6 text figs. & 43 figs. (3 coloured) on 11 plates. [54 refs.]

The author states that there are obscurities and lacunae in our knowledge of the development of trypanosomes in the vertebrate hosts, and the investigation, the details of which are described in this article, was undertaken to clarify the former and fill in the latter. His article is of much interest and importance to all those studying the question.*

The "anomalous forms" described by many workers have been interpreted as involutionary rather than evolutionary, and denominated "polymorphism" whereas the author would regard them as stages

*A number of Dr Penso's figures are reproduced because the *Annali* are not readily accessible to many of our readers.

in the cycle of development. He maintains that if these forms occur not only in the same species of animal but also in one individual animal, and that under unchanged conditions of environment, nutrition, temperature, etc., the term "polymorphism" has practically no biological significance.

The author's researches were carried out with a strain of *T. gambiense* obtained from the Public Health Laboratory of Italy and for experimental purposes he employed guineapigs, rabbits and white rats, injecting them first intraperitoneally and later intravenously with blood taken from the heart of infected animals. The changes in and

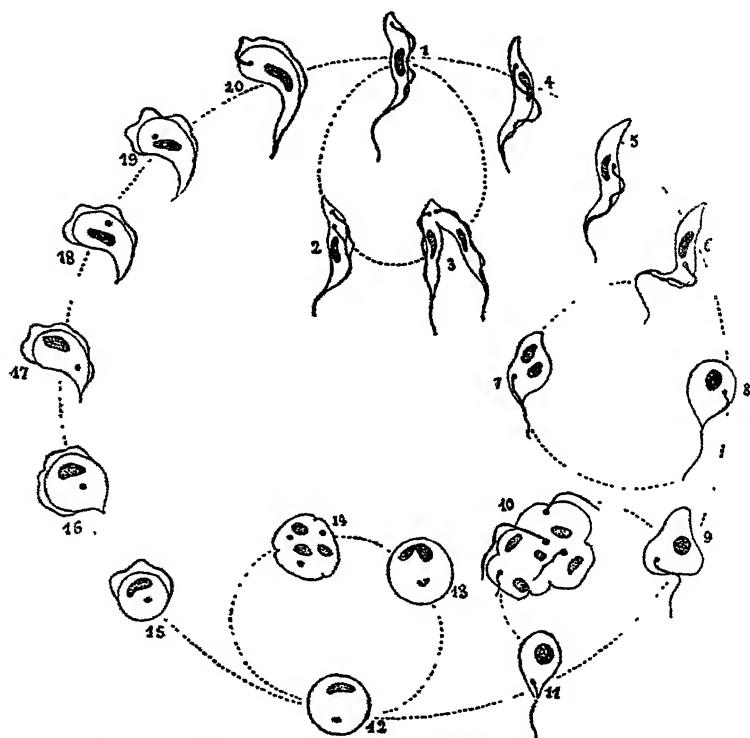


Fig. 1. Developmental cycle of *T. gambiense* in vertebrate host

1. Classical form of *T. gambiense*.
- 2 & 3. Classical forms undergoing binary fission.
- 4 & 5. Evolutionary forms evolving towards crithidial phase.
6. Crithidial form.
7. Crithidial form undergoing binary fission.
8. Crithidial form evolving towards leptomonad phase
9. Leptomonad form (early stage).
10. Leptomonad form in multiple fission (rosette form).
11. Leptomonad form (typical).
12. Leishmanial form.
13. Leishmanial form in binary fission.
14. Leishmanial form in multiple fission.
15. Post-leishmanial form.
16. Tadpole form (initial stage)
17. Tadpole form with anterior blepharoblast.
18. Tadpole form with blepharoblast above nucleus.
19. Tadpole form with posterior blepharoblast.
20. Pre-trypanosome form.

development stages of the parasite were studied by a series of smears of the peripheral blood and of the various organs and by histological examination of tissues fixed in Schaudinn's or Bouin's fluid immediately after the death of the animal.

In the first series he details the results in 11 guineapigs, 4 rabbits and 5 rats—the first twenty animals he dealt with—but the actual number used was 137. Detailed measurement of the trypanosomes seen in the peripheral blood at frequent intervals are presented in tabular form.

In another series he studied the morphological changes of the trypanosome occurring after injection of trypanocidal substances.

Then follows a detailed discussion of the findings. The author states that after inoculation the trypanosomes undergo typical morphological modifications, *succeeding one another and not seeming to appear casually* [the italics are the reviewer's], but occurring in a definite sequence and repeatable experimentally. Each of these is described in the letterpress, but the cycle as reproduced (Figs. 1 & 2) will demonstrate the main changes, and save lengthy description.

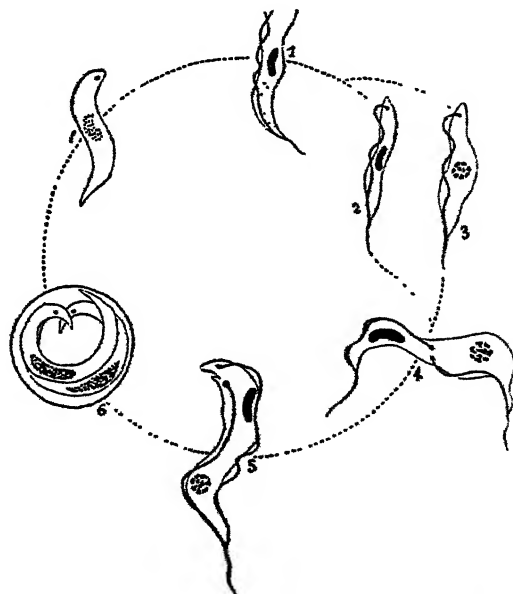


Fig. 2. Probable sexual cycle of *T. gambiense* in vertebrate host.

1. Classical form of *T. gambiense* (undifferentiated).
2. Type A form (probably female).
3. Type B form (probably male).
- 4 & 5. Successive stages of syngamy.
6. *Endotrypanum* (endoglobular phase).
7. *Endotrypanum* form (free phase).

A few words will, however, make the author's explanation of these clearer. He states the trypanosome forms as being of two types; the most noteworthy difference for our purpose (other differences are given in the text) is in the nucleus which in Type A is curved and elongated, "banana-shaped," but in Type B is spherical with large chromatin bodies mostly disposed marginally (see Fig. 3). These

two types he regards as sexual forms, not as evolutionary stages of one form and he illustrates them, and in fact all the stages, both by microphotographs, which are numerous and on the whole well reproduced, and by diagrammatic sketches. Some show the two types in union (Fig 4), according to Dr. Penso in copulation, and not, as some have interpreted the picture, as trypanosomes dividing.



Fig. 3 —(a) Nucleus of trypanosome of Type A.
(b) Nucleus of trypanosome of Type B

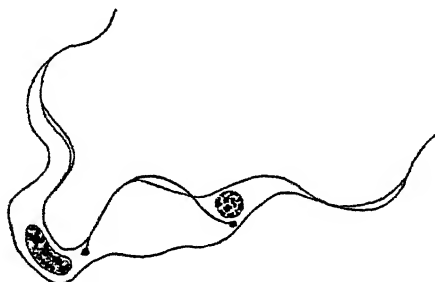


Fig 4 Trypanosomes of Type A and B in union.
[Reproduced from *Annali di Medicina Navale e Coloniale*.]

The next stage is the *Endotrypanum* form, differing mainly in the structure and position of the blepharoplast (as in *T. cruzi*); then follow *Critidial* forms evolving to *Leptomonad* and later to *Leishmanial* forms. Soon after the disappearance of the parasite from the general circulation—the so-called “trypanolytic crisis”—special structures are to be found in the bone marrow and elsewhere, small *Leishmania*-like forms with a small undulating membrane having one or two undulations only, immediately posterior to the macro-nucleus; this increases in size and is called the *post-leishmania* form. Others are seen in which the protoplasm anterior to the blepharoplast is drawn out to a fine undulating membrane, and the parasite as a whole comes to resemble a “comma with an enlarged head”; this he denominates the *tadpole form* (forme a girino). Lastly, by migration of the blepharoplast in a posterior direction the *pre-trypanosome form* results, after which all that is needed for it to become a typical trypanosome is a more marked development of the flagellum and the undulating membrane.

Above is a sketch of the two types [sexual, according to the author's view] in conjugation, and another of the probable cycle of sexual development. All the stages sketched, and many others, are represented in the series of microphotographs appended to the article.

H. H. S.

BOURGUIGNON (G. C.) Arsénorésistance trypanosomique et corps latents [**Arsenic-Resistant Trypanosomes and Latent Bodies.**].—*Ann. Soc. Belge de Méd Trop.* 1934. Mar 31. Vol. 14 No. 1. pp 19-23

Although the majority of authors consider the "latent bodies," seen in certain organs and more rarely in the blood, as involution forms, others have advanced various hypotheses regarding the significance of these bodies. One of these theories is that it is such forms that are responsible for the development of an arsenic-resistant race of trypanosomes in animals which have been treated with atoxyl or tryparsamide.

With the object of examining this theory it occurred to Bourguignon that it would be interesting to ascertain whether a strain of *T. gambiense* strongly resistant to arsenicals would not, under the influence of arsenical treatment, liberate into the peripheral blood latent bodies capable of carrying on the resistant strain. Experiments of this kind performed on 7 guinea-pigs and 3 monkeys failed to afford any support for the hypothesis.

W. Y.

ZOTTNER (G). Possibilité d'obtention d'un antigène alcoolique stable pour le diagnostic des trypanosomiasés animales par déviation du complément [**A Stable Alcoholic Antigen for the Diagnosis of Animal Trypanosomiasis by Complement Deviation.**].—*C. R. Soc Biol* 1934. Vol 115. No. 1. pp. 19-20.

The diagnosis of animal trypanosomiasis by complement deviation has been the subject of much work, but up to the present only one antigen, that of WATSON, has given good results. Watson's antigen consists of trypanosomes, freshly obtained, carefully washed and preserved on ice in a glycerin-formalin mixture; it has a high antigenic value and a low anticomplementary power, but it has the great disadvantage that it cannot be kept for more than a few days. Zottner has consequently attempted to prepare an antigen as specific as WATSON'S, but more stable. After many efforts he believes he has at last succeeded in obtaining a stable alcoholic antigen, which gives as good results a year after preparation as it did immediately it was made.

Rats infected with *T. equiperdum* or *T. marocanum* are bled at the height of the infection into 1.5 per cent. sodium citrate solution. The mixture is centrifuged slowly in a hand machine until the red corpuscles are sedimented. The plasma containing the trypanosomes is then removed and centrifuged at high speed to throw down the trypanosomes. The white or rosy deposit consisting almost entirely of trypanosomes with a few red cells is then washed thrice, the first time in distilled water to lyse the red cells, and the remaining two times in physiological saline. After the third washing the supernatant fluid is removed as completely as possible from the deposit, to which is added acetone. After a final centrifugation the deposit of trypanosomes is placed in an incubator for the evaporation of the acetone. The dry deposit of trypanosomes is then ground up in a mortar with a few drops of absolute alcohol, and finally a suspension is made consisting of 1 cgm. of dry trypanosomes in 10 cc. of absolute alcohol. The suspension is placed in hermetically sealed bottles of coloured glass and kept at 40°C. for 15 days; each day the bottles are thoroughly shaken. This completes the preparation of the antigen.

For use the alcohol is evaporated in a watch-glass and physiological saline is slowly added drop by drop so as to obtain a uniform suspension. The liquid thus obtained should be faintly opalescent. The volume of the saline suspension should be 5 times that of the alcoholic suspension.

According to the author the antigen thus prepared is stable and can be used for the diagnosis of trypanosomiasis by the method of complement deviation.

W Y

POINDEXTER (Hildrus A.). **Observations on the Defense Mechanism in *Trypanosoma equiperdum* and *Trypanosoma lewisi* Infections in Guinea Pigs and Rats.**—*Amer. Jl. Trop. Med.* 1933. Nov. Vol 13. No 6 pp 555-575. [16 refs.]

The injection of sugar into the peritoneal cavity of guinea-pigs producing an artificial hyperglycaemia favours the rate of reproduction of *Trypanosoma equiperdum* in the blood to such an extent that the incubation period after inoculation is shortened and death supervenes two or three weeks earlier than in control animals. Injection of pilocarpin also shortens the incubation period and increases the number of trypanosomes in the blood of an infected animal, but this is due merely to contraction of the spleen, which is the most important organ of the reticulo-endothelial system in the defence against infection. Infection at first stimulates the haematopoietic organs, as indicated by a temporary increase in the red cells, an increase which is lost when haemolytic activity manifests itself. Infection in the pregnant guinea-pig is milder, though the offspring suffer. Towards the end of an infection there is a reduction in the number of trypanosomes associated with a destruction of red blood corpuscles producing an anoxaemia which is largely responsible for the death of the animal. There is a significant decrease in the resistance of the red blood corpuscles as contrasted with a *T. lewisi* infection in which there is none. The change in size of the spleen of rats infected with *T. lewisi* is parallel to the change in guinea-pigs infected with *T. equiperdum*. An increase in the monocytes and platelets of the blood runs parallel with the increase in the size of the spleen in *T. lewisi* infections. Rats recovered from *T. lewisi* infection live longer when infected with *T. equiperdum* than control animals.

C. M. Wenyon.

WHITNALL (A. B. M.). **The Trypanosome Infections of *Glossina pallidipes* in the Umfolosi Game Reserve, Zululand. (Final Report.)**—*Onderstepoort Jl. Vet. Sci. & Animal Industry.* Pretoria. 1934. Jan. Vol. 2. No. 1. pp. 7-21. With 1 fig.

This report deals with the results of dissection of wild *G. pallidipes* during the period October, 1932, to June, 1933; and a comparison is made with those recorded in the last report [see this *Bulletin*, Vol. 30, p. 457]. Attempts were made to follow the possible effect of a reduction in the fly population by means of traps upon the trypanosome infections of the tsetse. The flies dissected were all caught in the "Harris" trap, in either the Sijembeni (A.5.) or Dengeza (B.4.) sections of the game reserve.

The total number of flies examined in the present work was 1,129 compared with 1,606 examined the previous year. A summary of the results obtained at re-examination is given in a table. The percentage of flies infected appears to have increased from 3.42 to 5.14. This increase affects both sexes. The males of the two observations have respectively 3.31 per cent. infected and 6.87 per cent., and the females 3.46 per cent. and 4.45 per cent. There was an increase in the case of each species of trypanosome. *T. vivax* was still the predominating infection and represented 39.7 per cent. of the total infections. *T. congolense* came next, forming 36.2 per cent. of the infections, and *T. brucei* last, with 12.1 per cent. The percentage of mixed infections appears to have slightly decreased. The author states that in assessing the significance of these results consideration must be given to external factors, e.g., trapping of the flies has been carried on continuously in eastern sections of the reserve and has greatly reduced the fly population; in the western sections trapping was abandoned from December, 1931.

Game and its movements is also a factor which must have a great influence on the trypanosome infections of the fly, and, unfortunately, this factor cannot be accurately recorded even by continuous observations. In comparing the infections found in the two Sections A.5 and B.4, the author notes that there was considerable variation in the local conditions. Section B.4 was in the abandoned area, and consequently fly conditions were returning gradually to normal. Section A.5 was in the area of continuous operation and conditions regarding fly density were abnormal owing to intensive trapping. The fly density in Section B was great, while in Section A.5 it was very low. The results of proboscis examinations of flies caught in these two localities are given in tables. The percentage of flies infected varies considerably. The author states that it is remarkable that these variations have occurred in localities about 5 miles apart, they suggest amongst other things that the flies do not pass with any regularity from one focus to another. The analysis of the results presented in the two tables indicates further that the infectivity varies in one locality from month to month.

In another table, the author gives figures showing the possible effect of reducing the fly population by trapping upon the trypanosome infections. The general inference from this work is that, as the fly population becomes less dense, the percentage of flies infected has increased; the increase has occurred in the number of males infected.

Whilst engaged on fly dissection a peculiar anomaly in the glands and hypopharynx of *G. pallidipes* was noted. Among 1,129 flies examined, 32 (2.8 per cent.) showed a distinct thickening of the salivary glands, and in each case where the salivary glands were thickened the hypopharynx was degenerated. The glands may be swollen to more than four times their normal thickness and show convolutions without signs of infection. In these cases, the hypopharynx is broad and stumpy, being approximately three or four times the normal breadth and sometimes less than $\frac{1}{10}$ th of the normal length. The fact that mature infections of *T. brucei* have been found in such flies indicates that they can feed and live for at least three weeks. Seven infections have been found in the 32 cases of this anomaly; three of the proboscis group (*T. vivax*); one of the proboscis and gut group (*T. congolense*), and three of the proboscis gut and salivary gland group (*T. brucei*). In no case, however, were trypanosomes seen in the degenerated hypo-

pharynx, and the question arises whether such flies are capable of transmitting infection. After considering this matter, the author concludes that in these cases *T. brucei* could probably be transmitted, but not *T. vivax* or *T. congolense*.

In conclusion, details are given of a severe outbreak of nagana in the winter of 1932, where it seemed probable that *Stomoxys* transmitted the infection.

W Y

VAN HOOF (L.) & HENRARD (C.). Recherches sur les trypanosomes pathogènes du bétail à Léopoldville (Congo Belge) [**The Pathogenic Trypanosomes of Live-Stock at Leopoldville.**—*Ann. Soc. Belge de Méd. Trop.* 1933. Dec 31 Vol. 13. No. 4. pp. 495-516. [11 refs.]

Since the beginning of 1932, the authors have been impressed during their dissection of wild tsetse flies by the number of flies infected with trypanosomes pathogenic to domestic animals. They pointed out to the Administration that this was probably the explanation of their failure to rear stock, and with a view to throwing further light on the matter they decided to examine (1) the natural index of infection of *Glossina* in the neighbourhood of Leopoldville, where game and stock are equally rare, and (2) the same index in districts where the density of *Glossina* was great and where infected animals were present.

This work has enabled the authors firstly, to assess the gravity of animal trypanosomiasis in the district investigated and the efficacy of certain drugs, and secondly, to discover polymorphic trypanosomes of animals and trypanosomes pathogenic to man.

A number of wild *G. palpalis* were caught in three districts in the neighbourhood of Leopoldville. Dissection showed that the flies were infected with *T. congolense* and *T. grayi*. The infection rate with the former trypanosome varied from 0.7 per cent. to more than 4 per cent., according to the abundance of the vertebrate reservoir in the district. In a second series of experiments, 1,345 *G. palpalis* were caught and fed on 11 goats, an antelope (*Tragelaphus spekei*) and 5 guineapigs. All the goats became infected, 3 with *T. congolense*, 1 with *T. vivax*, and 7 with a double infection of *T. congolense* and *T. vivax*; the antelope also became infected with both *T. congolense* and *T. vivax*; 3 of the 5 guineapigs became infected with a large polymorphic trypanosome (*T. pecaudi-brucei*?) and the other two with a mixed infection of this trypanosome and *T. congolense*. Details are given of the evolution of these infections in a large number of animals, chiefly goats, and the effect of treatment upon them.

The next portion of the report deals with the endemicity of trypanosomiasis in goats and pigs indigenous to the Lower Congo. A single blood film from a considerable number of these animals was examined from different localities. The results show that *T. congolense* was by far the most important trypanosome. *T. vivax* was found on only a single occasion. In two other tables the results of treatment of animals infected with *T. congolense* and *T. vivax* respectively are summarized. The drugs used were Dn12, Dn18, Dn. 20, Bayer 204, trypanosan, tartar emetic, and mixtures of Bayer 205 and the Dn compounds. The results obtained were only moderate, but the temporary sterilizing effect of Dn compounds is interesting. W. Y.

KUNERT (H.) & KRAUSE (M.). Findet in *Glossina morsitans* eine zyklische Entwicklung des *Trypanosoma evansi* statt? [Does Cyclical Development of *T. evansi* take Place in *Glossina morsitans*?—*Arch f Schiffs- u. Trop.-Hyg.* 1934. June Vol. 38. No. 6. pp. 257-259.]

The authors made 5 unsuccessful attempts to infect *G. morsitans* with *T. evansi*.

Freshly hatched *G. morsitans* were fed for one or more days on guinea-pigs, and in one experiment on a goat, infected with *T. evansi* and thereafter on a series of healthy guinea-pigs. In the 5 experiments, 51, 21, 87, 308 and 280 flies were used. The conclusions reached by the authors from this work are that *T. evansi* may be transmitted mechanically by *G. morsitans*, but a cyclical development of the parasite does not take place in these flies. The first of these conclusions is apparently based on the single experiment, details of which are summarized here.

Days	1-8	51 <i>G. morsitans</i> fed on a heavily infected guinea-pig.
"	9	Flies starved.
"	10	Fed on a healthy guinea-pig (1st filter animal).
"	11	Fed on a healthy guinea-pig (2nd filter animal).
"	12-40	Fed on a healthy guinea-pig.

The flies were then all killed and dissected with negative results.

In both the "filter" animals a few trypanosomes appeared in the blood on the 19th and 23rd days, respectively. In the 1st filter animal the trypanosomes were only found once, and in the 2nd filter animal on 3 days; thereafter the blood was always negative. The third guinea-pig used in this experiment did not become infected nor did any of the guinea-pigs in any of the other 4 experiments. [It is unfortunate that no information is supplied regarding the genesis and subsequent maintenance of the strain of *T. evansi* used in this experiment. For all we are told it may be an old strain of doubtful origin which has been maintained for years in European laboratories by syringe passage. If this proves to be the case, obviously inferences drawn from work of this sort must be regarded with great suspicion. The observations recorded in the experiment outlined above, relating to the mechanical transmission of the trypanosome to guinea-pigs by tsetse 2 and 3 days respectively after the last feed on the infected animal, are certainly remarkable. Previous work on mechanical transmission has raised considerable doubt whether such a thing occurs apart from that due to "interrupted feeding."] W. Y.

DIAS (Emmanuel). Estudo sobre o *Schizotrypanum cruzi*. [Studies on *Schizotrypanum cruzi*.]—*Mem. Inst. Oswaldo Cruz.* 1934. Feb. Vol. 28. No. 1. pp. 1-110. With 12 plates. [124 refs.]

This paper represents a revision of the life-history of *Trypanosoma cruzi* and of the method of its transmission. The work was conducted partly at the Instituto Oswaldo Cruz and partly in the Lassance province of Brazil.

It is unfortunate that the author persistently refers to the parasite as *Schizotrypanum cruzi*, in spite of the fact that this name has long ago been rejected by its creator (CHAGAS, 1911) and the original name,

Trypanosoma cruzi Chagas, 1909, reinstated. The latter name, which has been used in the previous publications of Dias himself, should be retained both because it is the only valid one and for the sake of uniformity in the nomenclature of the trypanosomes.

The first part of the paper is devoted to the development of *T. cruzi* in the vertebrate host. This proceeds along familiar lines, but special emphasis is given to the histotropism of this parasite. During the early periods of infection the trypanosomes first of all invade and multiply in the tissues at the site of inoculation, showing a particular predilection for the cellular elements of the reticulo-endothelium. According to Dias, *T. cruzi* is primarily a parasite of the R.E. system, only secondarily adapted to other tissues, the most important of which are the striated muscles, while some races derived from the armadillo are neurotropic. It would appear that the R.E. system plays no rôle in the defensive mechanism, since the course of infection in animals is not affected by splenectomy or by blockade.

The immunity which develops is only a relative one, the animals being subject to relapses and remaining susceptible to reinfection. The serum of recovered animals does not seem to have any of the trypanocidal, agglutination or adhesion properties found in other trypanosomiasis.

The invertebrate cycle of development and transmission of *T. cruzi* were studied in laboratory-bred *Triatoma megista*, the common vector of Chagas' disease in the province of Lassance. In the main part the findings of Dias confirm the earlier observations of BRUMPT, but these are now established on firmer ground by the elucidation of some obscure points which gave support to the partisans of the inoculative method of transmission. The development of *T. cruzi* normally takes place within the alimentary canal of the bug, the infective metacyclic trypanosomes being produced in the hind-gut (represented by the rectum only). It has been established experimentally that infection of the vertebrate takes place exclusively by contamination of the mucous membranes or of the intact skin with the droppings of the bug containing the infective stages of the trypanosome, or by ingestion of the bug itself (in the case of armadillo), whereas complete failure followed the numerous attempts to obtain infection through the bite of infected triatomas. The claims of the supporters of the inoculative method of infection were based on the alleged finding of trypanosome forms in the salivary glands of the bug, and on infection of animals by its bite. Dias failed to find any flagellates in the salivary glands of infected *Triatoma*. As regards successful inoculation through the bite, this was undoubtedly due to the survival of unaltered blood trypanosomes in the stomach of the bug: these have been observed up to 8 days after the infective feed and were shown to be capable of producing infection under experimental conditions.

The results obtained by Dias deprive Chagas' hypothesis of the inoculative method of transmission of *T. cruzi* of all grounds for further consideration and establish its position within the *T. lewisi* group without any *arrière-pensée*. The author notes that in districts where trypanosomiasis occurs the beds of the inhabitants commonly harbour triatomas and the bedding is always found to be soiled with the droppings of the bugs and with blood-spots from those insects that had been crushed after a feed. "This circumstance," the author remarks, "is of great importance in understanding the mechanism of contaminative transmission of Chagas' disease."

C. A. Hoare.

UNIVERSIDAD BUENOS AIRES MISIÓN DE ESTUDIOS DE PATOLOGÍA REGIONAL ARGENTINA JUJUY. 1934. Publicación No. 14 pp 1-24. With 8 figs. (1 map), pp 25-42. With 9 figs, pp 42-45. With 2 figs—Investigaciones sobre la enfermedad de Chagas. I. Comprobación de formas agudas de tripanosomiasis americana en el Chaco Austral y Santaefecino [**Acute Form of Chagas's Disease in Southern el Chaco and in Santa Fé.**] II. Comprobación de formas crónicas cardíacas de tripanosomiasis americana en el Norte Santaefecino. [**Chronic Forms of the Same.**] III. Nuevas investigaciones sobre animales naturalmente infectados con *Trypanosoma cruzi* en el Norte Santaefecino. [**Study of Animals Naturally Infected with *T. cruzi* in Northern Santa Fe.**] [ROMAÑA (Cecilio)].

In the first of these papers the author states that on an average 60 per cent. of *Triatoma infestans* examined in this district showed infection by *T. cruzi* and that 36 per cent. of the local armadillo, the nine-banded, (*Dasyus novemcinctus*) were carriers of it, and further that there was widespread infection of *T. geniculata* in the human dwellings. He then relates in detail two typical cases, one a boy of 8 years, the other a girl of 2½ years, with their cardiograms, X-ray pictures, blood counts, etc., and the results of inoculation of their blood into puppies. He draws no definite conclusions, but records the findings as indication for further study.

In the second, two chronic cases are recorded, aged 40 and 51 years respectively. They appear to be quite typical; a footnote mentions the death of the first suddenly (probably by syncope) six months after the last note in the text.

The third gives brief notes of the results of examination of the blood of 10 puppies in Villa Guillermina between March 22 and April 13, 1933; two were found infected; also one among six examined in Colonia Florencia. The blood of these was inoculated into rats, and, in the case of the last and one of the other two, parasites appeared in the blood 4 and 8 days respectively afterwards. H. H. S.

CHAGAS (Evandro). Infection expérimentale de l'homme par le *Trypanosoma cruzi*. [**Experimental Infection of Man with *T. cruzi*.**—C. R. Soc. Biol. 1934. Vol. 115. No. 12. pp. 1339-1341. With 1 fig.

An account is given of experimental infection with *T. cruzi* of a patient suffering from untreatable malignant disease.

The patient was inoculated subcutaneously with the infected blood of a guineapig. On the second day after inoculation an inflammatory local reaction was observed. The temperature rose to 39°C. on the 7th day, and thereafter ran an intermittent course until the 28th day, after which there followed an apyrexial period of 8 days' duration, which was in turn succeeded by another pyrexial period. Trypanosomes were discovered in the blood for the first time on the 38th day, although subinoculations into guineapigs were positive on the 17th day. Trypanosomes were seen in the peripheral blood for only 5 days. No clinical manifestations of visceral involvement have been observed during the first 50 days, but observation of the case is being continued.

The serum reaction of Machado was positive as early as the 10th day, more intense by the 17th day, and strongly positive by the 26th day. Fragments of tissue—subcutaneous and muscular—were removed

from the site of inoculation on the 12th day. There was evidence of intense inflammation characterized by an abundant exudate of mononuclear cells, lymphocytes, plasma cells, and macrophages. Agglomerations of parasites were visible in the muscle fibres and in the macrophages, but the number of parasites was very small in comparison with the intensity of the inflammatory reaction. W. Y.

JACKSON (C. H. N.) **The Causes and Implications of Hunger in Tsetse-Flies.**—*Bull. Entom. Res.* 1933. Dec. Vol. 24. Pt. 4. pp. 443-482. With 4 figs. [20 refs.]

The author holds that *Glossina* has permanent homes in which it breeds and rests, and that it goes out and visits definite areas for feeding, by distinguishing the "hunger stage" of flies, much may be learnt about their biology.

The author's thesis appears to be that, in the permanent home of the fly, a low proportion of females comes to man (not because the insects are absent but because they are digesting previous meals or engaged in finding places in which to deposit larvae). The numbers of young fly are also low because, though they have emerged in the permanent home, they rapidly go away elsewhere for food. It follows that the majority of flies caught in the permanent home are mature males, most of which are not very hungry. In the feeding grounds, on the other hand, a human being catches flies which are more hungry, and the proportion of females and young flies is generally higher. The type of vegetation which is chosen as a permanent home or a feeding ground differs with different species of *Glossina*, but the view is expressed that this distinction may be observed in several species, among them *G. morsitans*, *G. swynnertoni* and *G. palpalis*.

To reach these conclusions the author defines four stages, of which the first is the gorged fly and the fourth the hungry fly: in addition to these, he recognizes "young flies." He has developed methods of marking a large number of flies in such a way that they may be individually recognized if they are recaptured (*ante*, p. 216). A considerable number of experiments are described. In one of them flies were caught and marked in the permanent home and their "hunger stage" noted: a considerable number were subsequently recaptured in the feeding ground, and those which had been hungrier when they were marked were recaptured earlier than those which had been less hungry. [In describing these experiments, the author gives no facts about the numbers of fly which were marked and never recovered: this information appears to be relevant, for if the proportion of recaptures in different groups was very different, one might feel less confidence in the significance of the figures.] Other evidence is given showing that, generally speaking, the interval between marking and recapturing is related to the number of "hunger stages" through which the fly has passed. If the interval is one or two days, one or two stages will generally have been passed; but if it is longer, the fly may have gone through a complete "hunger cycle." Season has a considerable effect on the duration of this cycle.

[The author has studied a very difficult problem, the detailed bionomics of a wild insect under natural conditions. Much of his material is new and interesting, and if his views are correct he has added considerably to our knowledge of the tsetse community. But the conscientious reader (and assuredly no one else will get far into this

paper) will notice a number of points which call for comment. In diagnosing the hunger stage, the author relies on twelve external characters, eight internal characters and four points of behaviour, and his description of his method of diagnosis runs to $8\frac{1}{2}$ pages. One can hardly believe that it is possible to arrive at a sharp diagnosis by any method as elaborate as this, and one feels that there must be a strong personal element in the matter. Yet this diagnosis is the basis of the work, and much is built on a foundation which seems insecure. Might it not be possible to arrive at a quantitative and simpler diagnosis of the hunger stage? The later stages in the argument are frequently incapable of rigid proof, and it seems desirable that some precise experimental evidence should be accumulated. A third point which calls for comment is that the author has written three papers on this particular matter, and in each of them he has used a different nomenclature for the successive stages of hunger. These changes, like all other changes in nomenclature, are doubtless intended to make the reader's task easier.]

P. A. Buxton.

JACKSON (C. H. N.). **On an Advance of Tsetse-Fly in Central Tanganyika.**—*Trans. Roy. Entom. Soc. London*. 1933. Dec. 30. Vol. 81. Pt. 2. pp. 205–221. With 1 folding map.

In a certain part of Tanganyika, *Glossina morsitans* has apparently extended its range very greatly within recent years. The author describes the advance, and discusses its possible causes.

In a part of the Central Province of Tanganyika, it appears that *G. morsitans* has extended its range, in some place spreading about fifty miles in the last thirty years or so. The author is definitely of the opinion that this is due to actual spreading; he is clear that the country now occupied by the fly was previously entirely free, and that the phenomenon is not one of multiplication in an area which was previously thinly inhabited by this insect. His evidence is given at considerable length, and in such a matter one must accept the judgment of the man on the spot. None the less, the reader, ignorant of the locality, observes that part of the district was previously unmapped, and has apparently only recently been studied by Europeans. Is there really no possibility that small foci of fly have been scattered widely over it for centuries? The paper concludes with a discussion of the factors which may have caused this extension, and of the directions in which further spread may be anticipated. It seems clear that the determining factors are in the vegetation, influenced perhaps by occasional years of abnormally high or low rainfall. Attempts to study the phenomenon directly by liberating marked flies were inconclusive.

P. A. B.

HARRIS (R. H. T. P.) & WHITNALL (A. B. M.). **The Vegetable Diet Theory of *Glossina pallidipes*.**—*Onderstepoort J. Vet. Sci. & Animal Industry*. Pretoria. 1934. Jan. Vol. 2. No. 1. pp. 101–111.

This paper finally disposes of the fantastic assertion by A. DAVIDSON (a layman), originally made and rashly acclaimed some two years ago in a portion of the South African Press, that *G. pallidipes* can subsist and breed upon a diet formed by the latex of certain plants, especially *Euphorbia tirucalli* and *Sarcostemma viminale*, whence it derives the trypanosomes of which it becomes a vector.

The investigations now described were carried out at the Nagana Research Station, in Zululand. Groups of ten *G. pallidipes*, caught in "Harris" traps, were placed in glass jars covered with mosquito netting and allowed to suck blood from a donkey, in order that, when the experiments commenced, all might be in the same condition as regards hunger. Controls were employed, and it is interesting to note that, out of ten flies which were given a single meal of donkey's blood, but nothing further, four (one male and three females) had lived for fifty-seven days when the experiment was stopped. In the actual test, when jars of flies were inverted over unwarmed "mats" made of *E. tirucalli* and *S. viminalis* twigs, none of the insects attempted to feed. Warming the twigs over hot water caused a reaction to the extent that the flies tried to bite; but they invariably failed to pierce the vegetable cuticle and epidermis with their proboscides, and eventually became too weak to make the attempt. Microscopic examination of the mats showed no sign of exuding latex, such as would have been seen had punctures been made, and no trace of latex was found in the guts of flies which died.

Latex was then drawn off into tubes—either formed from the caecum of an antelope, or closed with skin from a freshly killed bird—and diluted with physiological saline to prevent coagulation; in one instance a mixture of citrated blood and latex was employed. After being starved for three days, batches of *G. pallidipes* were brought into contact with the tubes, the mixture in which had been slightly warmed. Under the influence of the temperature, the flies were induced to probe and pierce the membrane covering the warm latex. After they had done so, however, they quickly withdrew and cleaned their proboscides; and flies which had imbibed some of the latex either expired in a few minutes, or died in from one to twelve hours, according to the amount ingested. The mixture of blood and latex had a similar effect.

The foregoing summary should suffice to establish the authors' contention that *G. pallidipes* does not attempt to feed upon latex in nature, and that "therefore any theory in regard to the trypanosome infection of tsetses being derived from plant flagellates is entirely without foundation."

E. E. Austen

LAMBORN (W. A.). **Medical Entomologist's Report for 1932.**—*Ann. Med. Rep. on the Health & Sanitary Condition, Nyasaland Protectorate, for Year ending 31st December, 1932.* Appendix I. pp. 54-60.

During 1932, while the area occupied by *Glossina morsitans* remained generally the same as in 1926, in the Fort Manning District the fly made one "definite southerly advance," subsequently dealt with effectively by clearing, burning and settlement. In the Namwera Fly Area where, no doubt partly owing to the abandonment of estates, encroachment continues, *G. morsitans* suddenly advanced five or six miles during the late rains.

Experiments to test the possibility of cyclical transmission of *Trypanosoma rhodesiense*, *T. brucei* and *T. congolense* by arthropods other than *Glossina* proved uniformly negative. Even as regards possible direct transmission by similar agents, in only two out of many trials with *T. rhodesiense* was success obtained, the subjects of experiment in these instances being three species of *Tabanus* and two of

Stomoxys. Thinking that blood-sucking but non-biting species of *Musca*, which batten on superficial lesions including punctures inflicted by other flies, may well be transmitters, the author late in the year turned his attention to these, with what result is not stated.

E. E. A

DELPY & BOURRET Sur un cas de maladie du sommeil — *Arch Méd et Pharm Nav* 1933 Oct -Nov -Dec Vol 123 No 4 pp 712-715

MORODER (Juan) Enfermedad del sueño Resumen de las publicaciones aparecidas en los ultimos cinco años — *Medicina Paisés Cálidos* Madrid 1933 July, Sept & Nov Vol 6 Nos 4, 5 & 6 pp 241-269; 337-355; 417-449 [360 refs]

CORRECTION.

ELSHOUT (J. M) & LENTJES (L J. M.). De beri-beri epidemie op het eiland Onrust. [**Epidemic Beriberi on the Island of Onrust.**]—*Geneesk-Tijdschr v Nederl.-Indie.*—1933. Oct 10 Vol. 73. No 21. pp. 1288-1298

It was stated erroneously in No. 7 of this *Bulletin*, p. 477, that the isle of Onrust in question is off Holland at the mouth of the Zuider Zee. It is in fact a small island a few miles from Batavia in Java, and is used as a quarantine station.

A. G. B

REVIEWS AND NOTICES.

FAIRBROTHER (R. W.) [M D, M R C P]. **Handbook of Filterable Viruses.**—pp. ix+193 With 4 figs on 3 plates & 2 text figs. 1934 London: William Heinemann (Medical Books) Ltd., 99 Great Russell Street, W.C.1 [7s. 6d.] [Review appears also in *Bulletin of Hygiene*]

This is a perfectly simple straightforward record of the elementary facts regarding filterable viruses. The first part of the book deals with general properties. After a brief historical introduction, there is a discussion on the nature of the filterable viruses, a description of their cultivation and microscopy, and of the types of immunity to which they give rise. The second part deals with special diseases caused, or probably caused, by filterable viruses. In the interests of clarity it would probably have been better if a sharper division had been made between the general properties of the filterable viruses and the diseases to which they give rise. The author's classification, for instance, is not one of the viruses but of the virus diseases. The chapter on epidemiology and immunity would likewise have been more in place if it had come later, and had served as an introduction to the diseases caused by filterable viruses. *G. S. Wilson.*

LEWIS'S MEDICAL AND SCIENTIFIC LIBRARY. **Second Supplement to Catalogue, 1931-1933.**—112 pp 1934. London: Lewis's Library, 136 Gower Street, W.C.1. [2s net, (to Subscribers 1s net)]. [Catalogue revised to end of 1927 and Supplements 1928-30 and 1931-33, 16s net, (to Subscribers 8s. net.)]

Since the publication of the new and revised edition of the main "Catalogue of Lewis's Medical and Scientific Lending Library" in 1928, two triennial Supplements have been issued to keep the work up-to-date. The second of these Supplements, now noticed, gives titles of over 3,000 books added to Lewis's library in the period 1931-33. It follows the same arrangement as the main Catalogue, with an "Authors and Titles" list followed by an "Index of Subjects". The subject headings in the latter indicate the wide interests served by the library, and the shifting of emphasis with change in outlook. Thus subjects such as 'Mesmerism' and 'Phrenology' drop out, while new headings appear for 'Careers,' 'Contraception,' 'Ecology,' 'Mental Tests,' 'Nudism,' 'Sterilization,' 'Town Planning,' etc. 'Psychology' is a subject that shows much development, and now has sub-headings for 'Educational,' 'Industrial,' 'Social,' and 'of the Unconscious,' in addition to those used in the main Catalogue. The classification has also been revised in places; for instance, the heading 'Emotions,' which covered books on 'laughter,' 'joy,' and 'happiness' in the 1928 Catalogue, no longer stands, books on these subjects being classed now with works on 'nightmares,' 'inhibitions' and 'neuroses' under 'Psychology.' Altogether these Supplements, with the main Catalogue of Lewis's library, provide a most useful guide to modern English books on medical and scientific subjects. *R. L. S.*

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THE PREVENTION OF ASCARIS INFECTION : A CRITICAL REVIEW.

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The literature studied below deals with the conditions in which the infective larva develops within the ascaris egg after it leaves the human body, with its mode of re-entry into this, and briefly with its migrations within the body as it passes to its adult habitat in the small intestine. In considering the measures which should be taken to prevent infection, it is pointed out that too little weight seems to have been given to the pig, or to air convection.

THE BIOLOGY OF THE EGG.

Of course it is only the fertile egg which can develop. The unfertile egg, recognized as such over 30 years ago, has been studied and pictured in its various forms by OTTO (1932, 29, 751)* and KELLER (1933, 30, 684). The former basing his remarks on the examination of over 50,000 eggs found 15.9 per cent. of them to be unfertile, emphasized the ease with which the outer albuminous coat is dissolved in decinormal caustic soda solution, and noted the occasional presence of a triangular unfertile form; he added that the solitary female worm might produce either fertile or unfertile eggs. †Keller reported that unfertile eggs were commonest in infections with 1 to 5 females;

* References, unless otherwise stated, are to summaries in this *Bulletin*, the first figure giving the year; the second, in blackface type, the volume number, and the third the page of the *Bulletin* containing the summary in question. Where the year of publication of the original paper differs from the year of publication of the *Bulletin* summary, two dates are given—the first in brackets referring to the original paper, and the second to the *Bulletin* summary.

† ESSED & VAN THIEL (*Geneesk. Tijdschr. v. Nederl.-Indië*. 1934. Apr. 24 Vol. 74. No. 9. pp. 551-552. With 4 figs. on 1 plate) report a case in which polar thinning of the shell in some unfertile eggs gave the appearance of an operculum.

when there were more than 5 of these the percentage of unfertilized eggs decreased YOKOGAWA and WAKEJIMA (1932, 29, 737) reported, however, that unfertile eggs were commoner in heavy than in light infections YOSHIDA and TAKANO ((1923) 1924, 21, 218) showed that fertile eggs readily lost their outer shell in artificial gastric juice, so that a person passing decorticated eggs in the faeces may merely have swallowed them. No such coprophagic suggestion is of course tenable if the faeces are being examined in caustic soda solution, which also decorticates them

Physical Factors Influencing Survival and Development of the Egg

Temperature—BAKKER (1924, 21, 959) showed that temperatures of $-30^{\circ}\text{C}.$ to $-190^{\circ}\text{C}.$ were deadly to the eggs, while one of $-15^{\circ}\text{C}.$ had no influence on further development at $25^{\circ}\text{C}.$, temperatures between $-15^{\circ}\text{C}.$ and $-30^{\circ}\text{C}.$ killed some eggs and delayed subsequent development of the survivors, the proportion of those killed and damaged increasing in proportion as the temperature fell and the duration of exposure lengthened. CRAM (1924, 21, 958) showed that eggs become less resistant to cold as their development progresses, an observation confirmed by PANAGIA (1933, 30, 684) Thus, when freshly passed, an exposure of 40 days to temperatures of $-2^{\circ}\text{F}.$ to $-16^{\circ}\text{F}.$ ($-19^{\circ}\text{C}.$ to $-27^{\circ}\text{C}.$) did not prevent development when the temperature became favourable, when partly developed the eggs similarly withstood such a temperature for 20 days, and although the lifespan of the developed embryos was thereby shortened they nevertheless remained infective to guinea-pigs MARTIN ((1926) 1928, 25, 960) found that at temperatures from $-5^{\circ}\text{C}.$ to $+10^{\circ}\text{C}.$ eggs could survive for 2 years in a dry medium and for four years in a moist one These exactly measured experiments amply confirm those of YOSHIDA ((1920) 1921, 17, 80) that eggs in or on the ground survive the winter in Osaka, Japan, and of MARTIN that they resist freezing and are viable after lying in the soil of Nebraska all winter BROWN (1928, 25, 958) confirmed the results of other workers that the eggs are completely embryonated in 23 to 26 days at $21^{\circ}\text{C}.$ and in 10 to 11 days at $30^{\circ}\text{C}.$; and noted that on raising the temperature from the one point to the other each stage of development was equally quickened— $2\frac{1}{2}$ times. At body temperature development stops when 4 to 8 cells have been formed, at $70^{\circ}\text{C}.$ all are killed (WHARTON, 1915, 6, 304). OGATA ((1924) 1925, 22, 882) reported that at $70^{\circ}\text{C}.$ only one second is needed to effect this, but at $65^{\circ}\text{C}.$ sixty seconds.

Oxygen.—BROWN (*l.c.*) showed that each egg consumed about 0.0000026 cc. of oxygen during its development whatever the temperature, that with an oxygen tension of 2.1 to 2.6 cc. per litre of water (or about half the normal) development proceeds normally, but that when it is as low as 1.1 cc. per litre this is slowed. It is not lack of oxygen which stays development at $37^{\circ}\text{C}.$, for at that temperature its volume is 4.5 cc. per litre. Further Brown showed that embryonated eggs were not injured by a stay in oxygen-free water of 6 weeks or more, so that such eggs would survive at least for a time at the bottom of a pond where the water did not contain enough oxygen for development.

Moisture.—It seems impossible to measure with accuracy the amount of water in the surroundings of eggs by means which will not dehydrate the egg itself, but it appears that all surrounding water can be lost without injuring the egg. WHARTON (*l.c.*) noted that while drying did not kill the egg a small amount of water was necessary for development.

RANSOM and FOSTER ((1917) 1918, 12, 186) reported that drying delayed development, but that this was resumed on wetting. That dried eggs can survive for as long as 2 years at temperatures as low as -5°C has been noted. MANALANG (1927, 24, 997) placed in a desiccator for 7 days eggs which had been dried on to a slide, when placed in Kroneker's fluid larvae developed, and some maintained mobility for a further 27 days. BROWN ((1928) 1929, 26, 548) found that when embryonated eggs were allowed to dry on glass all were dead in 37 days, nearly all in 28 days, and many after 7 days. The dried but living eggs developed a bubble within them which was pushed about by the moving embryo. SPINDLER ((1929) 1930, 27, 972) reported from South-West Virginia that viable embryonated ascaris eggs were always found in unshaded dry dooryards of families whose members were infected with the parasite.

Sunlight.—The last observation raises the question of the effects of light apart from heat. In BROWN's experiments no difference was found between cultures exposed to and shaded from the sun, the maximum temperature being 90°F (32.2°C .) except on one day when it reached 101°F . (39°C .) MANALANG (1927, 24, 997) found that eggs failed to develop when dried on a slide and exposed to sunlight for $1\frac{1}{2}$ hours; if suspended in Kroneker's fluid light was lethal in 2 hours.

Chemicals.—The extraordinary impermeability of the ascaris shell is well known. YOSHIDA ((1918) 1921, 17, 79) summed up the matter thus. Embryos develop within the eggs in the following percentages of chemicals, hydrochloric acid 0.7, carbolic acid or nitric acid 0.3, acetic acid 4, formalin 5 [dilute formalin is a favourite culture medium], corrosive sublimate 0.7, common salt 7.5, sodium hydrate 1.0. He reported urine to be soon fatal to them, but MANALANG found motile embryos in eggs after nine days culture with it, this being a normal interval in the conditions of his laboratory. These strengths it will be noted are not those which cannot be exceeded without harming the egg. As to acidity SCHMELEWA ((1929) 1931, 28, 226) experienced no retardation of development when pH remained between 3 and 8.

Hatching.—There has long been uncertainty as to the conditions which induce hatching. Thus YOKOGAWA ((1923) 1924, 21, 215) could merely put them generally as—full development of the embryo with suitable temperature, and possibly embryonic activity stimulated by intestinal peristalsis. It can hardly be a mere question of action of the digestive juices of the host, for MANALANG (1927, 24, 997) had no hatching when eggs 4 months old with motile embryos were kept in duodenal or ileal contents obtained from man within an hour of death, or in 0.2 per cent hydrochloric acid or sodium hydroxide, although the embryos remained motile for 2 to 4 weeks. KONDO ((1920) 1922, 19, 233) reported that ascaris eggs cultured out of doors in animal charcoal which was kept moist and away from direct sunlight reached maturity in 70 days, and a few days later hatching began, the larvae being then capable of living in wet soil for more than a month. The only condition which seems to have been reported as inevitably producing rupture of the eggshell is drying followed by moistening (BROWN, 1928, 26, 548); he noted (*v. supra*) that with drying a large bubble forms, presumably of gas, which the active embryo pushes about as it moves; on moistening, water seemingly re-enters the shell and causes increased tension since the contents are prevented from swelling to their natural size by the imprisoned bubble, and the shell bursts. Whether KONDO's act of keeping cultures moist really meant wetting when the culture dries does

not appear from the English summary. DANHEIM (1925, 22, 879) had previously reported that moistening of dried eggs of *Ascaris equi* caused them to hatch.

Longevity of the egg.—Among modern reported instances is that already noted of MARTIN—2 years when dry and 4 years when humid

THE FECUNDITY OF ASCARIS AND ITS IMPLICATION.

By dissecting out the genital systems of two adult female worms, imbedding in celloidin portions from different levels, sectioning these, and counting the number of eggs in several sections from each level, CRAM (1925, 22, 883) estimated the number of eggs developed or in process of development at any moment as being from 26 to 27 millions; considerably less than the computations of ESCHRICHT or LEUCKART. BROWN and CORT ((1927) 1928, 25, 464) comparing egg counts with worm recoveries in 2 cases put the eggs produced daily by each female worm as nearly a quarter of a million, MORETTI ((1928) 1930, 27, 974) as 107,000 in one child, and MANALANG (1928, 25, 960) as 1,420 to the gram [or 284,000 daily if the count was on the mushy 200-gm stool common in the tropics]. On the other hand the numbers of adult worms harboured by any person are mostly quite few. TWINING ((1930) 1931, 28, 688) published 475 as a supposed record, and although this is very far from being so, such a number as this is very rarely even approached. The chances must be millions to one against any particular egg resulting in an adult worm. The conditions, then, which have to be fulfilled before adult life can be attained must be reached with great rarity.

THE RELATIONSHIP OF ASCARIS IN MEN AND SWINE.

The old conviction that worms from the two hosts are morphologically indistinguishable is, with one questionable exception, fully confirmed (e.g., RANSOM and FOSTER 1919, 14, 153; SCHWARTZ 1920, 16, 146; KOIDZUMI *et al.* (1925) 1927, 24, 187; THORNTON 1924, 21, 573). BARKER (PAYNE *et al.* 1925, 22, 488) found the number of chromosomes in the two forms to be 48, though KOIDZUMI *et al.* stated that the haploid number in the human form appeared to be 12 and in the porcine 13. But it is held that there are nevertheless biological differences which those of that turn of mind hold sufficient to justify the use of two specific names, *Ascaris lumbricoides* for the parasite of man, and *A. suum*, *A. suis*, or *A. suilla* for that of the pig. Facts on which this conclusion rests need detailed consideration, for the matter is one of great hygienic importance.

STEWART (*Parasitology*, 1917, vol. 9, p. 213) used two pigs two months old. One was fed on 13 occasions with many thousands of ripe eggs 26 to 64 days old from the pig; when killed at five months a single small ascaris was found in the intestine. The other was on 9 occasions fed with large quantities of ripe eggs 22 to 106 days old from man, but no eggs appeared in the faeces; so when it was still under 4 months old and till it was 5 months old it had given to it large quantities of eggs from the pig 17 to 73 days old, but no eggs appeared in its faeces after an interval sufficient for their growth to the adult stage. There is no evidence here of two strains. Similar is the conclusion which follows from experiments in which STEWART ((1917) 1918, 11, 81; 1918, 12, 187) fed pig ascaris eggs to six pigs in such numbers that 1,000 larvae must, it was believed, have reached the trachea in each case. "Two of the pigs suffered from acute pulmonary ascariasis, a third from a slight attack

. . In five cases no intestinal worms resulted, in one case intestinal worms may have resulted but they may also have been due to accidental infection." Here ripe ascaris eggs from the pig signally failed to infect pigs. RANSOM and FOSTER too ((1917) 1918, 12, 186) failed to infect pigs, and in most of their experiments eggs from the pig ascaris were used. STEWART again (1919, 13, 212, (1919) 1920, 15, 230) fed ripe eggs of the pig ascaris to pigs which were 4, 4 and 70 days old. The first was fed with 22,000 eggs, and large numbers of young worms 3.8 mm. long were found when it was killed on the fourteenth day; the second was also fed with 22,000 eggs and showed an ascaris pneumonia, but not a single worm was found when it was killed on the nineteenth day; the third was fed with 50,000 eggs but showed no worms when the gut was opened on the thirty-first day. SCHWARTZ (1920, 16, 146) found a biological identity between the two forms so far as immunological tests showed. STEWART ((1920) 1921, 18, 122) fed four sucking pigs with ripe eggs of ascaris from the pig, one died of ascaris pneumonia, the other three showed small worms in the intestine when examined on the fifteenth, seventeenth and nineteenth days. Further he reported (1920, *Trans. Roy. Soc. Trop. Med. & Hyg.*, vol. 14, p. 20) feeding two pigs with ripe eggs of the pig ascaris, on the fourteenth day both had severe pneumonia, on the nineteenth day one had numerous small worms in the intestine, the other had none. KOINO ((1922) 1923, 20, 235) gave 500 ripe ascaris eggs from the pig to a volunteer and took 2,000 from man himself. Both suffered from rigors with fever and marked pulmonary symptoms, after an anthelmintic 50 days later the volunteer passed no worms and Koino passed 667. He adds "The conclusion is that while ascarids from the pig and man are morphologically similar there is a biological strain of pig ascaris capable of causing pneumonia in man, but incapable of reaching the adult stage in this host." It is merely necessary to refer back to the last of STEWART's quoted experiments to be satisfied that no such conclusion emerges from the facts of these two feedings. PAYNE, ACKERT and HARTMANN (1925, 22, 488) fed several thousand eggs of the ascaris of man to five pigs, all showed "thumps" (that is hurried breathing), but in none did intestinal infection occur; no parallel infection of pigs with pig ascaris was attempted as a control. Again, one of these writers swallowed 54 mature pig ascaris eggs without becoming infected; another who had formerly become infected with ascarids after five years engaged in the directing of hookworm campaigns (for which reason that infection was judged to have been of human and not of porcine origin) swallowed embryonated eggs of the pig ascaris and suffered no infection. Lastly MORGAN ((1931) 1932, 29, 59) fed three pigs when 2 months and again when 3 months old with large numbers of embryonated eggs of the pig ascaris; they had no symptoms and passed no eggs.

The importance of this summary is that it is believed to comprise the whole of the evidence published since this *Bulletin* came into existence, on which it is assumed that the ascaris of man and pig, though anatomically indistinguishable, are physiologically distinct. It is singularly unsatisfying, being based on a few instances in which feeding from man to pig or pig to man have failed to infect, whilst ignoring the more numerous and striking ones in which eggs of ascaris from the pig have failed to infect pig. It is clear that in this matter controls have been quite inadequate. FÜLLEBORN's reading of the evidence ((1931) 1932, 29, 751) was that swine eggs infect man but eggs

of human origin do not infect swine. At all events the reviewer can see no justification for neglecting the pig as a source, and perhaps a potent source, of human infection.

Obviously there are quite unknown factors at work in preventing maturation of pig ascaris eggs in pig, one of them, as has been pointed out in Japan, lies in the effects of vitamins. KOIDZUMI, HIRAISHI & KOINO ((1925) 1927, 24, 187, 1927, 24, 997) reported that pigs fed on eggs whether of porcine or human ascaris failed to mature, but when vitamin A was withheld from their diet they easily became infected with either type of egg, though the infection with eggs from man was never so plentiful as with those from the pig. These results appear to have been fully confirmed by HIRAISHI ((1926) 1927, 24, 998). Correlation of infections in man and pig have been made by COPEMAN (1925, 22, 881) and STIVEN (1925, 22, 883). Another possible factor is considered below, namely the suggestion that the alimentary canal is not the optimum portal of the entry of this infection.

MODES OF INFECTION.

BROWN (1927, 24, 998) refers to three modes of infection: (a) Embryonated eggs may be eaten stuck to vegetables or otherwise taken in with food, under which heading he adds these words "In the homes surveyed [in Panama] it was customary for the children and sometimes the adults to sit or squat on the floor while eating from a dish which was placed on the floor or on a small bench. This combination of living so close to the floor of their abode with the promiscuous defecation upon it by the children would naturally be suspected as a source of infection by ascaris." (b) They may be taken in drinking water. (c) He adds "Even windblown dust has been suggested as a source of ascaris infection." To this list must be added the possibility of infection by the skin.

1. Infection by Mouth.

i. *The route taken by larvae when eggs are swallowed.*—That infection may be produced by swallowing eggs has been known since GRASSI's time and has been instanced above, and it was then assumed that the embryos were hatched in the alimentary canal and there grew into adults. STEWART's experiments on rats and mice (1916, 8, 197) were the first to suggest that things were otherwise, for when he fed them on embryonated eggs the larvae were found in the lungs of these animals. Stewart was of opinion that they acted as intermediate hosts, passing on infection by being eaten by pigs, or by nibbling man's food and moistening it with their saliva, in which fluid he had found larvae. It was immediately pointed out in the *British Medical Journal*, and shortly afterwards over their signatures by others, that the then known facts were more reasonably explicable by assuming that the larvae hatched in the alimentary canal, bored by virtue of a thigmotaxy into its wall, reached the lung by the blood vascular escalator, were carried by the bronchial cilia to the larynx, and were swallowed—that there was here another instance of a route of infection established as occurring in the life histories of hookworms and strongyloides. That in the optimum host the larvae reach the lung by boring out of the alimentary canal is not now questioned; YOSHIDA, however ((1918) 1920, 15, 230, etc.) maintained that in such a host larvae bore through its wall into the peritoneal cavity and thence through the diaphragm and pleurae into the lungs; though he found in fact no larvae in the pleural cavity

and many in liver and lungs. The point was investigated numerically by RANSOM and CRAM ((1921) 1922, 19, 234). After an infective feed larvae became very numerous in the portal vein, liver, vena cava and right heart in 17 to 24 hours, numerous in the mesenteric glands in 20 to 24 hours, though after 5 days these contained as many dead as living larvae. In the abdominal cavity none appeared for 3 days, and after that they were found in small numbers only, and in a fraction only of the infected. In the pleura the greatest numbers were found in 6 to 7 days and they had developed considerably. A few scattered larvae were found in peripheral lymph nodes within 24 hours of infection and in the thyroid and thymus, FULLEBORN ((1921) 1922, 19, 234) found them in the kidney after this organ, except for the hilum, had been enclosed in a rubber sheet through which larvae cannot bore, and in the brain, as well as, so far as *belascaris* goes, in the foetus; ISHII and YAMASHIRO (1932, 29, 752) found them invariably in the urine of rabbits which had been fed with 200,000 mature eggs, OHBA (1925, 22, 882) invariably as well as red corpuscles in that of heavily infected animals, SUYEMORI (1925, 22, 487) in the eye, OTAKE ((1928) 1929, 26, 551) in the mammary gland. These observations form evidence, which most will consider conclusive, that the lymph escalator from the alimentary canal is not a favourable one, but that the use of the blood escalator would give such a distribution as has actually been observed. The use of the pulmonary escalator was proved directly for man by KOINO ((1922) 1923, 20, 235), who found larvae in the sputum from the ninth to the sixteenth day after a deliberate infection, 178 being so detected on the 11th day alone; for fortuitous infection the same has been reported by LEITCH ((1929) 1930, 27, 974) on 4 occasions during the invasion stage, and by BIRK (1933, 30, 684).

ii. *Eating embryonated eggs.*—That this may on occasions result in experimental infection has been amply shown above. As to its producing natural infection, PANTIN ((1918) 1919, 13, 212) noted that bitter experience convinced her that vegetables fertilized with nightsoil were a most sure cause of infection, and COPEMAN (1925, 22, 881) attributed a local endemic in Hertfordshire to this cause. ISOBE ((1925) 1926, 23, 257) reported from Formosa 13 *ascaris* eggs on a single spinach plant, 2 embryonated eggs on an onion and one on a cabbage; WALKER (1927, 24, 998) considered eggs on vegetables as being responsible for an *ascaris* incidence of 87.71 per cent. in one battalion at Singapore. ISHIKAWA ((1929) 1931, 28, 225) showed that vegetables manured with the "bricks" into which heaped manure is fashioned in Manchuria carried *ascaris* eggs; while the inner parts of such "bricks" retain moisture, and from them were obtained viable eggs even after exposure to summer heat and severe winter cold. Similarly, to vegetables manured with human faeces was attributed infection in Tura Prison, Egypt (KHALIL, 1931, 28, 665), ova being found in the soil adherent to them in the jail kitchen. STEKHOVEN (1931, 28, 666) had a like experience in the island of Terschelling; YOSASATO and SUMI (1932, 29, 739) put the percentages of vegetables bought in Mukden and bearing worm eggs, largely those of *ascaris*, as: lettuce 92, spinach 54, radish 43, onion 33, cabbage 17, potato 8. As to the second means considered under this heading by BROWN, his meaning seemingly is that food is infected by hands which have been touching or resting on a floor contaminated with embryonated *ascaris* eggs, or that such fouled hands are themselves licked or sucked. There is, however, always the chance of infective dust being blown on to food, or being left on it by flies.

iii *Drinking embryonated eggs*.—The likelihood of this method of natural infection was reaffirmed by CHANDLER ((1925) 1926, 23, 265, (1926) 1927, 24, 190, 191) thus: "The fact that the defaecation areas are commonly situated on the banks of hulas [ponds], and that in the dry season the hulas themselves are used as defaecation sites, suggested that the water in the hulas might be responsible for the abundant and heavy infections with these parasites." And again "It is very obvious that on this island the tanks must be nearly all grossly polluted." On the other hand, certain villages "gave remarkably low incidences of ascaris and trichuris infections considering the fact that the tanks which they used for drinking were grossly polluted." Embryonated ova were not sought for in any case; while in the earlier ones the argument seems to depend much on what the writer would expect to occur, and in the last instance the facts were clean against the presuppositions.

2. Infection through the Skin.

K. KONDO ((1920) 1922, 19, 233) smeared hatched larvae on the skin of guineapigs and recovered them from the lungs later, observations confirmed by ASADA ((1921) 1922, 19, 657) and stressed by MAPLESTONE ((1928) 1929, 26, 548). It is not stated in the English abstracts of the Japanese papers what steps were taken to insure that the guineapigs did not lick the spots on which the larvae had been placed, and the reviewer has hitherto been unable to obtain further information. Previous to this, RANSOM and FOSTER (1919, 14, 153) had injected embryonated eggs under the skin of guineapigs and had recovered larvae from the lungs. What, if any, effect a perspiring skin may have in freeing an embryo from a dried egg which has landed on it, so paving the way for cutaneous infection, is quite unknown.

3. Breathing in of Embryonated Eggs.

Infection by air conveyance to food has just been mentioned, flies being possible conveyors of eggs by this medium. That a privy might have a radius of action infective for neighbours was shown by STILES ((1915) 1916, 8, 209) for ascaris among other infections, and entry of infection into the new host was held to be coprophagic, faecal matter being conveyed to food probably by flies and so eaten. But what is here in mind is infection by inspiration—the breathing in of embryonated eggs as dust—the evidence for which, in spite of the "even" in the quotation from BROWN (above p. 610) seems to the reviewer to have steadily increased since he first formally suggested it (Discussion: STEWART 1920, *Trans. R. Soc. Trop. Med. & Hyg.*, Vol. 14, p. 20); but it is circumstantial and inferential, no direct experiments having ever been reported. It is clear that such a mode of infection spares larvae a transit through the liver which is presumably a handicap to them, and such transit, it is suggested, should be considered as a possible reason for the repeated failures to infect pigs with ripe ascaris eggs from the pig, that mode of infection not being the optimum one.

Three considerable investigations bearing on this matter have been published during the last eight years—from China, the Southern United States, and Panama; in each case the pertinent material is contained in more than one paper, so that these have to be compared to get a proper view in attempting evaluation. The points apposite to the present review are these.

CORT and STOLL ((1931) 1932, 29, 416) reported the degree of ascaris incidence among nearly 4,000 persons living in 5 different areas in China.

In all areas human faeces are used as fertilizer ; in two they are stored dry and in three wet. In making dry fertilizer (CORT *et al* (1926) 1927, 24, 193) faeces are mixed with clay and straw, and the mixture piled outside towns or along village streets and there left to dry , in making wet fertilizer faeces are kept in liquid form in vessels until the time comes to spread them on the fields. In the two districts in which dry fertilizer is used the respective incidences of ascaris infection were 90 and 86 in males and 94 in each in females. One lay in the dry region of North China and in it footbinding was almost universal, so prohibiting women's work in the fields ; while in the other the climate was considerably milder with heavier rainfall, and there was little footbinding. In the three districts using wet fertilizer the percentage incidence in males was 58, 45 and 63.5, the corresponding figures in females being 70, 75 and 77, the women being field workers and footbinding little or rare. The five districts thus fall into two intensity groups, and the only reported factor which is common to all members of each group is the kind of fertilizer prepared by its members , and clearly the mode of manufacture used in the dry method must favour distribution of ascaris ova as dust. A confirmatory experience is that of KHALIL ((1933) 1934, 31, 327) in the Siwa Oasis of Egypt, in which ascaris infection is very heavy and dried human faeces are collected from house latrines and used as manure.

In the Southern United States the outstanding attitude of those who have recently investigated ascaris infection there is concisely summed up in OTTO's words (1932, 29, 749) : " The sanitary privy [a pit privy] or in fact most any type of privy no matter how obnoxious if used by all members of a family will effectively control infestations with these parasites." Again OTTO and SPINDLER write ((1930) 1931, 28, 174), " The introduction of the privy, however, has apparently done little to control the *Ascaris* burden in many areas because regardless of the presence or absence of a privy the younger children deposit their stools close to the house and in playgrounds where eggs are readily conveyed by dirty hands and food to the mouth."

These are not, however, conclusions proceeding from observations. They are conjectures. But the matter has in fact been tested in Panama in conditions which at least approach to those of control of single factors, and the conclusions which emerge from these seem to the reviewer to be quite different. Here there lie two adjacent villages, Marica Arriba and Sardina (CORT *et al.* (1929) 1930, 27, 421), each on the same subsoil, each strung along a horse trail, with similar houses set in small cleared areas, and with cultivation or rank jungle coming to within five or ten yards of them ; further, each village contained 121 inhabitants. "Sanitary" latrines, which were in fact pit latrines (CORT *et al.* (1929) 1930, 27, 431), were built in Sardina in November-December, 1925, and surveys made thereafter showed that a very great reduction in soil pollution occurred ; the privies were being largely used. Marica Arriba was left "unsanitated" and, as just stated, conditions as between the two villages closely approached to the control of that single factor. At the first stool examination, made in July, 1926, that is to say after privies had been in use in Sardina for 8 or 9 months, "sanitated" Sardina had an average egg count per cc of 23,190 and Marica Arriba one of 16,100 ; at the last examination made in February, 1927, the average count in "sanitated" Sardina had risen to 48,540, and in unsanitated Marica Arriba had fallen to 13,010. The outstanding fact is that in spite of a great reduction of soil pollution in Sardina ascaris

infection markedly increased. Here again it was to children that such soil pollution as persisted was attributed in Sardina, but in Marica Arriba, where things were as they had been, children of course continued to pollute it. To attribute the increased infection in Sardina to soil pollution by children implies that to stop the fouling of soil by adults will increase in some way the infectivity of eggs contained in the faeces of children if these only are deposited on the soil. That view will hardly appeal to medical sanitarians. The position is that the building and use of "sanitary" privies was followed by, and that it presumably caused, a marked increase in ascariis infection, for these constituted the only discoverable and reported differences between these two neighbouring villages. It does not seem that the increase in infection in Sardina is explicable on grounds other than its air convection, for most of its inhabitants were now religiously visiting the latrines—spots where faeces were accumulated—and the density of eggs if air-borne must be greatest just in those places, diminishing apparently as something like half the cube root of the distance from their source. This line of argument assumes that skin infection by hatched larvae need not be reckoned with, but in either case it was the privy which spread the infection.

The reviewer's own experience is apposite here. During his Darjeeling inquiry which covered faecal examinations on 30,000 persons (LANE, 1916, *Indian Jl. Med. Res.*, Vol 4, p 274; 1917, *ibid*, Vol 5, p. 350) he found that on only two of ten tea gardens were the coolies provided with latrines, and that these had been in use for a number of years. In one garden the latrines were of the drop privy type—platforms built out from the steep hillside—faeces dropping through holes in them to land and remain stinking further down the slope. On that garden ascariis infection was greater than on any other, namely 82·88 per cent. against an average of 69·4 for the other nine. Manifestly the conditions in the garden with drop privies were almost ideal for aerial convection and ill-fitted for any other kind.

Another pertinent investigation in Panama is that by BROWN (1927, 24, 998) at Penemone, two miles from the villages dealt with in the last paragraph but one. From 201 gm. of sweepings collected from the interior of seven huts he isolated 29 developing, 8 viable embryonated, and 9 degenerated eggs, or 46 in all, from 20 gm. of soil from the yard of a hut the corresponding figures were 11, 3 and 3, or 17 in all; and from 20 gm. of soil taken from under the eaves of a hut he isolated 24,000 eggs, all being in developing stages or degenerated. As noted, he seems to ascribe the heavy infections which actually occurred in these households to an acquisition during feeding within the houses. In point of fact eggs were far more numerous outside than inside the dwellings, and their distribution seems to correspond with that which would occur were developing eggs blown into dwellings by draughts. CORT ((1931) 1932, 29, 59) points out rightly that the presence of ascariis can be used as an index of the local status of sanitation; accepting this standard, it is noteworthy that the incidence of ascariis infection has been increased in different parts of the world by the building of privies, even those that are labelled "sanitary." As the writer has suggested ((1932) 1933, 30, 55) to provide a village with latrines and label it "sanitated" is to confuse faith and works. Experiments to test the possibility or ease of infection by the inbreathing of ripe eggs seems never to have been undertaken.

PREVENTION

The prevention of ascaris infection does not, then, lie in the installation and use of pit privies. Whether the anaerobic state and fermentative conditions in the septic tank privy will do so, must seemingly depend on whether decomposition in the fluid medium can be depended on to destroy these eggs in all conditions within a given time. STILES (1911, Publication No. 2, Rockefeller Sanitary Commission) reported that, after four months in the miniature L R S septic tank privy, about a fifth of the ascaris eggs appeared to be alive. The Beccari process (*Bulletin of Hygiene*, 1931, Vol. 6, p. 191) of refuse disposal will raise the temperature of the vat to 70°C, and if it does so throughout will be successful in killing all ascaris eggs. It has been used with encouraging results on a relatively small scale for stable manure (SCHWARTZ *et al.* 1931, U.S. Dept. Agric., Yearbook of Agriculture, p. 353). Low temperatures ordinarily met with seem to have no practical hygienic importance. The adequate scalding of vegetables which will be eaten raw kills eggs adhering to them. Disinfection of faeces by chemicals is an unpromising line of attack and the action of urine remains in doubt, as does that of sunlight. Drying kills eggs in due time; yet drying means dust. But to dry and then moisten viable eggs is the only way hitherto reported in which hatching of the embryo can inevitably be brought about, and it is noteworthy that such conditions will be very exactly reproduced when viable eggs imbreathed as dust come to rest on the mucosa of the air passages. The experimental evidence which claims to show the lack of infectivity for man of ripe ascaris eggs from the pig is quite unconvincing (there is perhaps epidemiological evidence in the opposite direction) and to disregard the pig as a potential source of ascaris infection in man seems to the reviewer to be wholly unjustifiable.

The risk of air convection has hitherto been almost wholly disregarded, though it seems the best explanation of a good deal in the present anomalous and confusing position. It should be investigated experimentally. There seems no practical way in which embryonated eggs, dried and floating in the air, can in daily life be prevented from reaching the respiratory mucosa and thereon, it must be concluded, hatching; the only feasible line of attack is to prevent their reaching the air at all, and here treatment has its place. Sewered privies cleanly kept are sure safeguards for the user. But to devise privies of demonstrable effectiveness and inoffensiveness, to provide them for millions of people of poor means, and to alter the habits of these so that they religiously use and clean them, is a task which will not be completed within the lifetime of any of us. Yet most emphatically this consideration in no way justifies complacent acceptance of the present position. It is clear that much intensive work on the conveyance and means of prevention of this infection is urgently needed.

THE TYPHUS GROUP OF FEVERS.

VAN MEIRHAEGHE (A). Aperçu d'ensemble sur les fièvres exanthématiques attribuées au genre *Rickettsia*. [Summary Outline of the Typhus-like Fevers of Rickettsial Origin.]—*Rev. Belge Sci. Méd* 1934. Jan Vol 6 No 1. pp. 37-68. [143 refs]

This paper is a review of our present knowledge and of recent research work on typhus and typhus-like fevers. The major part is taken up with a full account of epidemic typhus from the historical, clinical and etiological standpoints, a special paragraph being devoted to the Weil-Felix reaction. Other varieties of typhus are then discussed, these are divided up as follows:—(1) Typhus of the New World. Tabardillo and Brill's disease, (2) Rocky Mountain spotted fever, (3) Sao Paulo typhus, (4) Japanese River fever, (5) Boutonneuse fever; (6) "Mite" fever of Sumatra.

Recent work on these diseases is fully discussed on the same plan as in the first section dealing with true typhus. It is pointed out that probably varieties No. 3 and 6 are identical with Nos. 2 and 4 respectively. A very valuable bibliography is appended including no fewer than 143 papers referred to in the article. D. Harvey.

DO AMARAL (Afranio) & MONTEIRO (J. Lemos). Histoire naturelle et classification des rickettsioses. Position systématique du "typhus exanthématique de S. Paulo." [Natural History and Classification of the Rickettsias.]—*Rev. Sud-Américaine de Méd. et de Chirurg.* Paris. 1933. Nov. Vol. 4 No 11. pp. 781-817. With 2 diagrams. [55 refs.]

The authors discuss the various classifications which have already been proposed for the typhus group of diseases (fièvres exanthématiques) and suggest that they should be grouped under the name "Rickettsioses." They adopt the view of FLETCHER that the *Rickettsia* bodies were originally parasites of plants, as are certain flagellates, and suggest that these parasites adapted themselves in mites which suck the juices of the plants, these mites infected rodents on which they fed and in turn other ectoparasites of the rodents became infected and *Rickettsia* was carried to man by the mite, the tick, the flea, and the louse in that order.

They propose that the Rickettsias should be grouped as follows:—

Group I. Diseases carried by the mite. Type.—Japanese River fever.

Group II includes the so-called "Tropical Typhus" of India, Africa and Malaya.

Group III. Tick-borne diseases. Type.—Boutonneuse fever.

Group IV endemic and epidemic typhus.

Group I.

Oriental Rickettsiasis.

1. Japanese type. *R. orientalis* Nagayo 1931

1a. Sumatra type " "

Group II.

Tropical Rickettsiasis

1. Malaya type. *R. megawur*

1a. Australian type. "

1b. Indian type. "

1c. African type. "

Group III

1. Boutonneuse Rickettsiasis. *R. conori*.
Mediterranean
2. Rocky Mountain Fever *R. rickettsi*
Western type
3. Rocky Mountain Fever *R. typhi*
Eastern type
4. Sao Paulo type *R. brasiliensis*

Group IV.

1. Brill's Disease *R. muricola*
2. Endemic Typhus *R. mooseri*
3. Trench Fever *R. pediculi*
4. Epidemic Typhus *R. prowazeki*

Group II includes several types of fever the etiology of which has not yet been fully worked out; when this has been accomplished it would simplify matters if this group disappeared, types I and 1a being included in Group I and types 1b and 1c in Group III where they naturally belong.

[A separate name is given to each of the Rickettsias associated with the different types of the disease; this is confusing to the student; if viruses have been shown to be immunologically identical it would appear that the Rickettsia associated with these viruses could be given the type name. This would reduce considerably the number of such names, thus:

Group I. *R. orientalis*—mite diseases.

Group III. *R. rickettsi*—tick disease.

Group IV. *R. prowazeki*—flea and louse disease.] D. H.

OTTO (R.). Flecktyphus und endemische Fleckfieber. [**Typhus and Endemic Spotted Fever.**]*—Zent. f. Bakt. I. Abt. Ref. 1934. Mar. 22. Vol. 113. No. 5/6. pp 138-144.*

This paper is a review of recent investigations on typhus and the typhus-like fevers in the old and the new world. Practically all the papers referred to have already been reviewed in the *Bulletin*.

The author divides the typhus-like diseases into 3 groups:—

1. Louse typhus of the Old World, "Fleckfieber."
2. The milder typhus-like fevers of the New World (Brill's disease and Tabardillo) carried by the rat flea from rat and mouse to man.
3. Typhus-like fevers carried by the tick (American Rocky Mountain fever) or by the mite (tsutsugamushi fever).

The following differential table is also given:—

<i>Epidemic Type.</i>	<i>Endemic Type.</i>
(Louse) spotted fever	(Rat) spotted fever
Typhus exanthematicus	Febris exanthematicus
Source of infection.	
From man to man—by the louse.	From rat to rat by rat flea or rat louse. Occasionally from rat to man by rat flea.
Symptoms in man.	
Marked nervous involvement; petechiae	Slight or no nervous phenomena; rose spots; no petechiae

<i>Epidemic Type</i> —cont	<i>Endemic Type.</i> —cont
	Prognosis
Grave	Good usually
	Season.
Winter and spring	Mostly summer and autumn
	Experimental animals
	Guinea-pig
Nodules in brain, occasionally slight scrotal swelling	Nodules scanty in brain, marked swelling of scrotum and periorchitis is the rule
	Rat
Inapparent infection, experimental passage of virus uncertain	Fever, experimental passage successful
	Rickettsia
Difficult to find in experimental animals	Numerous in cells of the tunica in experimental animal

D. H.

BADGER (L. F.) **Endemic Typhus of the United States.**—*Southern Med. J.* 1934 Feb. Vol. 27. No. 2 pp. 159-161.

The term "endemic" typhus is gradually replacing the name Brill's disease in America and elsewhere. This disease is immunologically identical with European typhus. It is apparently increasing in the States and, although rarely fatal, is a serious menace owing to the amount of incapacity it causes.

The vector is the rat flea and the reservoir is the rat, it is an urban disease and largely of coastal cities. The control of the disease should follow the lines of plague prevention—rat destruction and rat proofing of houses, shops, stores and ships.

D. H.

LÉPINE (P.) & BILFINGER (F.). Le typhus murin est une maladie épidémique des rats. [**Murine Typhus an Epidemic Disease of Rats.**]—*Bull. Soc. Path. Exot.* 1934. Jan. 10. Vol. 27. No. 1. pp. 2-7.

The authors noted that when rats were examined during the winter 1932-33, when cases of endemic typhus were occurring in Athens, a large number of rats were found to be infective and strains of typhus were readily obtained from fleas captured on these rats. A year later, when no human cases were reported, a much larger number of rats were examined, but only very few were found to be infected; over 1,000 fleas were inoculated into guinea-pigs and only one strain of virus was obtained. Discussing these results the authors are of opinion that rat typhus is not an endemic disease of rats (the infection lingering on continually) but an epidemic disease with sudden outbursts, the rat population then becoming immune and the virus disappearing, the disease only reappearing when a new and non-immune rat population is established; if the virus is then reintroduced another outburst will occur. After the epidemic outbursts a positive Weil-Felix reaction is found in many of the rats.

D. H.

ISABOLINSKI (M. P.), SOBOLEWA (R. M.), STRATANOWITSCH (N. J.), RIWKINA (S. L.) & MOSKALEWA (T. A.). Zur Frage der epidemiologischen Bedeutung der Weil-Felix-Reaktion bei Flecktyphus. [The Bearing of the Weil-Felix Reaction on the Epidemiology of Typhus Fever.]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1934 Feb 15. Vol. 81. No. 5/6 pp. 405-409 [Summary appears also in *Bulletin of Hygiene.*]

The Weil-Felix reaction was found to be positive in sera from 117 out of 1,097 healthy persons examined. Of these 117 sera, 38 came from persons who had suffered from typhus fever within the previous two years. The remaining 79 sera, constituting 7.2 per cent. of the whole, came from persons who had no history either of typhus or of contact with it. In this group the titres varied from 1/50 to 1/200, the commonest titre being 1/75.

Sera were also examined from 103 members of the medical personnel serving in the infectious division of the No. 1 Soviet hospital in Smolensk. Apparently 56 of these sera reacted positively, the commonest titre being 1/400. [The figures in the text are discrepant.] The majority of these positive sera came from persons with no history of typhus fever. The blood of 8 persons reacting at 1/400 was inoculated in 3 cc quantities intraperitoneally into guineapigs. Three of the animals became febrile on the 17th day and one on the 20th day, the temperature lasting for 5 or 6 days. Normal guineapigs inoculated from 3 of these animals likewise developed fever—this time after an incubation period of 6-7 days. It is interesting to note that one of the persons whose blood had been inoculated into a guineapig developed typhus fever. [This patient became ill either 8 days or some weeks after the blood had been examined; the text is not clear.] This suggests that healthy carriers of the typhus virus may occur amongst those in contact with patients.

In view of the fact that 7 per cent of sera from healthy persons who had never been in contact with typhus fever agglutinated *Proteus* X19, the authors regard the Weil-Felix reaction as of limited value in epidemiological studies.

G. S. Wilson.

APPEL. La lutte contre le typhus exanthématique dans le département de Constantine. Quatre années d'observation-déductions pratiques. [Four Years of Anti-Typhus Measures in Constantine.]—*Rev. Méd. et Hyg. Trop.* 1934. Jan.-Feb. Vol. 26. No 1. pp. 35-62.

There are many cases of typhus every year in this district of Algeria; the disease as a rule is mild in the native of the country but severe in the European; the author suggests as explanation in the one case an acquired or hereditary immunity, in the other too severe medication!

Although the disease does not occasion many deaths it is a serious cause of disability. It is a disease of the winter, clothes are never removed and baths not taken, lice are plentiful and infective louse excreta contaminate the skin. Influenza and bronchitis complicate the situation and famine causes movement of the people and crowding in certain places.

The disease usually appears first in the southern regions and spreads north, certain areas are endemic centres; every year it breaks out in these districts in the same villages and even the same houses.

The available transport for dealing with the disease is one Citroen ambulance and one $\frac{1}{2}$ -ton Citroen lorry to carry materials for disinfection. The campaign is carried out under 3 headings—(a) Search for cases; (b) Isolation of cases and contacts; (c) Disinfection. Cases are exceedingly difficult to find as there is concealment of the disease and many roads are impassable for wheeled traffic; villages are remote.

If a number of cases are detected in one village a sanitary section arrives and the clothing of the entire village is disinfected house by house by means of sulphur gas (owing to scarcity of water steam is not available); special cloaks are provided for the people while their clothes are being disinfected; or the clothes are disinfected in two lots. Isolation of cases is carried out in tents or a special house taken over for the purpose.

A special section of the paper deals with typhus among the nomadic peoples who come into the district from the south every year along the same routes and camp in the same places, and invariably bring typhus with them. Recommendations are given for dealing with the disease among these nomads and as regards provision for improved materials and more personnel for combating typhus. *D. H.*

DES ESSARTS (J. Quérangal). Au sujet d'un nouveau cas de typhus endémique bénin observé sur un navire de guerre, au port de Brest. [A Fresh Case of Endemic Typhus on a Warship at Brest.]—*Bull. Soc. Path. Exot.* 1934. Feb. 14. Vol. 27. No. 2. pp. 108-111.

A typical case of endemic typhus with a very marked maculopapular rash which involved the palms and soles. The Weil-Felix reaction was positive in a dilution of 1/6,000.

The interesting point is that the case occurred in the cruiser "Diderot" which had been laid up in the harbour at Brest for three years and no cases of typhus fever have been known to occur during these years in this port. Blood taken from the patient at the height of the fever and inoculated into a guinea-pig gave the typical reaction of rat typhus virus, *i.e.*, fever and marked swelling of the scrotum. *D. H.*

LEMIERRE (A.), LAYANI (E.) & PHAM-HUU-CHI. Sur un cas isolé de typhus bénin. [A Sporadic Case of Endemic Typhus?].—*Bull. et Mém. Soc. Méd. Hôpt. de Paris.* 1934. Feb. 12. 50th Year. 3rd Ser. No. 4. pp. 178-185. With 1 chart.

An isolated case of endemic typhus in the suburbs of Paris.

The disease commenced on 17th September 1933 with rigor and sweating and intense, persistent headache. Eight days later a profuse macular rash appeared which spread over the body and involved the palms and soles. Blood cultures (twice) were negative and also the Widal reaction. On the 29th of September the patient's serum gave a positive Weil-Felix reaction in a dilution of 1/1,000 and later of 1/500. It was discovered that the patient had had typhus fever (epidemic) in Russia in 1919 but his servant, who also had typhus in Russia at the same time gave a completely negative Weil-Felix reaction. *D. H.*

FENNEL (Eric A). **Endemic Typhus Fever in Hawaii.**—*Jl. Amer. Med. Assoc.* 1934. Apr. 7. Vol 102. No. 14. pp. 1135-1136.

The author describes a typical case of endemic typhus which gave a positive Weil-Felix reaction in a dilution of 1/10,000 with *Proteus* X19. He is of opinion that there have been in the past a number of such cases in Honolulu which have been diagnosed as typhoid fever. The sera of 3 such cases (fever 2 years ago) were tested and gave positive W-F reactions in dilutions of 1/320, 1/640 and 1/1,280. Up to date about 10 cases of typhus have been detected in Honolulu and are due, the author considers, to infection from rats. D. H

BABALIAN (A). Seize cas de typhus exanthématique traités avec succès par l'autohémothérapie [Sixteen Cases of Typhus treated with Success by Autohaemotherapy.]—*Bull. Soc. Path. Exot.* 1934. Mar. 14. Vol 27. No 3 pp 235-236. With 3 charts.

15 cc of blood was drawn off from the patient and injected, marked general improvement was noted and an early termination of the fever

D. H.

HESCHELES (I.) & FLECK (L.). Ueber die Eigentümlichkeiten der Exanthin- (Fleckfieberhaut-) Reaktion beim Menschen. [Characteristic Skin (Exanthin) Reaction of *Proteus* Extract in Man.]—*Ztschr. f. Immunitätsf. u. Exper. Therap.* 1933. July 20. Vol. 79. No. 5/6. pp. 514-520. With 2 figs.

The injection of this fluid into the skin of adults who have not had typhus gives rise to a marked cutaneous reaction, but only in about 50 per cent of small children and 75 per cent. at school age.

In adults the reaction continues positive during the course of other fevers, e.g., typhoid, relapsing fever, etc., but after the 5th to 7th day becomes negative in typhus cases. The course of the "exanthin" reaction was followed in 3 people during and after immunization with Weigl's *Rickettsia* vaccine; all were strongly positive before inoculation but became negative later when they developed a positive Weil-Felix reaction.

D. H.

MOOSER (H), VARELA (Gerardo) & PILZ (Hans). **Experiments on the Conversion of Typhus Strains.**—*Jl. Experim. Med.* 1934. Feb. 1. Vol. 59. No. 2. pp. 137-157. [25 refs.]

The authors have noticed that strains of typhus virus isolated from cases of fever in Mexico in long standing epidemics give the same reactions in experimental animals as do strains of the Old World typhus virus, i.e., inapparent infection in rats and fever without scrotal swelling in guineapigs. The present paper is concerned with the transformation of such strains into typical rat typhus strains.

The authors had observed that *Rickettsia* in lice and fleas multiply in the cells lining the alimentary canal and always in close and frequent contact with fresh blood, also in experimental animals these germs are found in the cells lining blood vessels and in blood plasma in the scrotal sac. The *Rickettsia* of epidemic typhus fever (Old World) are specially haemophilic. With this in mind rats were inoculated intraperitoneally with the virus and injections of fresh blood were made daily into the peritoneum; it was found that *Rickettsia* multiplied much more rapidly in animals so treated. By means of this

"blood" method it has been found possible to change these epidemic strains into murine strains; that is to say after several passages through rats with blood added, these strains produce severe fever in rats and fever and scrotal reaction in guineapigs; if only passaged through a few rats the strains may revert but after several passages they become fixed. A Tunisian strain of typhus virus from NICOLLE's laboratory when passaged in this manner also developed the same properties as the rat typhus virus.

Mooser has always been of opinion that the rat typhus virus is the original strain and that the epidemic virus results from the long passage of typhus virus through man-louse-man; the rat is the reservoir and inter-epidemic source of the virus and when passaged through the rat the virus again acquires the properties of the murine virus.

It has been suggested that the epidemic virus may be kept alive by means of mild unrecognized cases of the disease in man but Mooser and his co-workers point out that it is difficult or impossible to infect lice from such mild cases and that lice die of the infection whereas the rat flea does not. The rat is the reservoir of both the endemic and epidemic virus. D. H.

DIYER (R. E.). **Effect of Flea Passage on Epidemic Typhus Virus.**—*Public Health Rep.* 1934. Feb. 16. Vol 49. No. 7. pp 224-225.

MOOSER and others have claimed that if the virus of epidemic typhus be passed through the rat flea it produces in guineapigs a similar reaction to that of the endemic virus. The author was unable to produce a change of type.

The author obtained a strain of epidemic virus from BREINL and passed this through rat fleas; these insects were allowed to feed on infected rats, then collected and crushed up and injected into guineapigs. The first and second passages produced no change whatever in the action of the virus (no testicular swelling), the 3rd passage strain also showed no change until it became contaminated with *S. enteritidis* (Badger) and guineapigs having the cross infection with this organism showed scrotal lesions which, grossly, could not be differentiated from those caused by endemic typhus virus. D. H.

GRUNFELD (A. A.), SEREBRJANNAJA (A. I.) & NEUMANN (M. W.). **Experimentelle Studien ueber das Flecktyphusvirus. [Experimental Studies on the Typhus Virus.]—*Zent. f. Bakt.* I. Abt, Orig. 1933. July 11. Vol. 129. No. 1/2. pp. 56-69. With 7 figs. [11 refs.]**

The virus employed in this research was obtained from the blood of cases of the disease taken during the period from the 7th to the 12th day of fever. The blood was inoculated intraperitoneally into guineapigs in doses ranging from 2 to 4 cc. In two instances positive results were obtained and the virus was studied by passage through a series of guineapigs.

In addition to the characteristic febrile reaction in the guineapigs the following symptoms had also to be present before a positive result was returned.—1. Loss of weight. 2. A monocytosis. 3. Typical

typhus nodes in the brain and other organs, and also a sterile blood culture.

A very complete table is given showing 16 passages of the virus through guineapigs with the incubation periods, days of fever and presence of nodes, weight loss and monocyte counts. Cell counts of several infected guineapigs are given in graphic form.

Twenty-one rats were inoculated from guineapigs but only 3 reacted with fever, in one of these at post-mortem typical nodes were found in the brain. An emulsion of the brains of 5 of the rats which had not developed fever was made and inoculated into guineapigs; in one of these at post-mortem nodules were found in the brain. Rabbits were also inoculated with the virus in the testicle and it was found that it could be passaged in this manner and that this is a useful method for preserving the virus *in vivo*, up to 23 days in one instance.

D. H.

LÉPINE (P) & BILFINGER (F). Infection expérimentale du pou par le virus murin du typhus exanthématique. [**Experimental Infection of the Louse by Murine Typhus.**—*C. R. Acad. Sci.* 1934. Apr. 23. Vol. 198. No. 17. pp. 1553-1555.

Monkeys infected with European rat typhus virus develop a very mild type of fever and lice fed on these monkeys do not become infected. But by reducing the resistance of the monkeys by exposure to cold together with injections of India ink, a more severe disease develops and lice (*P. corporis*) fed on these monkeys show Rickettsia in the intestine about the 7th day, and become infective for guineapigs from the 10th to 16th day. The infection of lice with rat typhus virus from monkeys is another point in favour of the identity of the typhus viruses, endemic and epidemic.

D. H.

LAIGRET (Jean) & DURAND (Roger). Conservation des virus exanthématiques à basse température. [**Preservation of Typhus Virus at Low Temperatures.**—*Arch. Inst. Pasteur de Tunis.* 1933. Dec. Vol. 22. No. 4. pp. 499-504.

Typhus viruses die out rapidly at ordinary room temperatures and only survive for a few days at 0°C. but the authors have found that if kept at a temperature of -10°C. to -12°C. they survive for at least 20 days. Brains of infected guineapigs were placed in a Frigidaire at this temperature and the virus could be recovered up to 20 but not after 30 days.

D. H.

SILBER (L. A.) & DOSSÈRE (E. M.). Culture des virus du typhus exanthématique. [**Culture of Typhus Virus.**—*Arch. Inst. Pasteur de Tunis.* 1933. Dec. Vol. 22. No. 4. pp. 486-490.

— & —. Ueber Züchtung filtrierbarer Virusarten auf nicht-pathogenen Mikroben. III. Mitteilung: Kultivierung des Flecktyphusvirus.—*Zent. f. Bakt.* I. Abt. Orig. 1934. Apr. 5. Vol. 131. No. 3/4. pp. 222-232. With 12 figs.

The authors review previous research and point out that so far all workers have utilized living cells in their medium for the culture of Rickettsia. They note that Rickettsia multiplies rapidly in the gut

of the louse along with numerous saprophytic bacteria. They therefore inoculated flasks of broth with torula and sarcina and with small quantities of blood taken from patients at the height of an attack of typhus or else small portions of the brain of infected guineapigs. The cultures were incubated at 30°C for 8 days. By this method they were able to passage the virus through at least 8 generations. Temperature charts are shown, demonstrating the reactions in guineapigs after inoculation with these cultures. Cultures from the tissues of these animals proved sterile and the virus was passed on to other animals which reacted in a typical manner. Typical typhus lesions were demonstrated in the brains of the infected animals and microphotographs are given of these and also other photographs showing numerous Rickettsia bodies in the protoplasm of the cells of the tunica vaginalis of guineapigs infected by the 8th generation of culture, and from guineapigs passed from these.

Rabbits inoculated with the culture virus developed a positive Weil-Felix reaction although they showed no other signs of infection. Lice were inoculated by the rectum with small amounts of the culture and killed after a period of 4-6 days; numerous Rickettsia bodies were demonstrated in the cells lining the alimentary canal.

The authors remark that this method of employing bacterial cells in place of tissue cells may be found useful in the cultivation of other viruses besides Rickettsia. D. H.

KLIGLER (I. J.) & ASCHNER (M.) Cultivation of European Type of Typhus Rickettsia in Presence of Live Tissue.—*Proc. Soc. Experim. Biol. & Med.* 1933. Dec. Vol. 31 No. 3 pp. 349-351.

The intestines of lice, infected with the European strain of typhus virus, were removed aseptically and placed in a drop of saline solution on a sterile slide. Normal guineapig tunica tissue was macerated in the fluid and allowed to stand for 15 minutes; small amounts of this were then placed in 3 cc Tyrode serum and incubated at 30°C. for 8 days. When examined numbers of Rickettsia were found in the cells and also free in the fluid. A successful subculture was made and proved to be infective for a guineapig. The strain was passaged.

D. H.

FEJGIN (B.) & SPARROW (H.). Au sujet de quelques microorganismes, isolés des organes de cobayes et rats infectés par le virus typhique murin de Mexico. [On Bacteria Isolated from the Organs of Guineapigs and Rats Infected with Rat Typhus Virus of Mexico.]—*Arch. Inst. Pasteur de Tunis.* 1933. Dec. Vol. 22. No. 4. pp. 477-485.

Guineapigs and rats were inoculated with Mexican virus; the former were killed on the first day of fever, the latter about the 8th day after inoculation when the Weil-Felix reaction was positive. The organs and blood of these animals were used for cultivation experiments.

In 7 cases a gram positive bacillus, diphtheroid, was isolated from the guineapigs. In 5 cases a motile Proteus bacillus, which did not produce indole, was isolated; this bacillus was of the X19 type and was agglutinated by the serum of rabbits which also agglutinated cultures of X19. D. H.

NICOLLE (Charles). Sur les conditions de la recherche des infections inapparentes chez les animaux qui ne réagissent pas visiblement à l'inoculation du virus d'une fièvre exanthématique ou d'un produit dans lequel on suppose sa présence. [**On the Conditions of Research into Inapparent Infections in Animals which have not shown any Symptoms after Inoculation with the Virus of one of the Typhus Fevers or of a Product in which the Presence of such a Virus is suspected.**]*—Arch. Inst. Pasteur de Tunis.* 1934. Mar. Vol. 23. No. 1. pp. 19-31.

Professor Nicolle apologizes for the prolixity of his title but explains that to abridge it in any way might obscure the exact meaning.

It is now generally agreed that in typhus research inapparent infections do frequently occur. There are two methods of confirming an inapparent or symptomless infection in animals.

(1) *The direct method.*—After injection of the virus or material which is suspected of containing the virus the usual incubation period is allowed to elapse; heart blood is drawn off from the animal at the time when the fever would be at its highest point in the usual course, and is injected into other guineapigs; if these animals react typically the result is positive and we still have the original animal alive for further test. A still more certain method is to kill the original guineapig and to inject emulsion of the brain into other animals. The original animal is however no longer available.

(2) *The indirect method.*—The animal which has not reacted must be kept until the 20th to 30th day after inoculation and then tested for immunity with a known typhus virus of fixed virulence which produces fever regularly in guineapigs. The recently isolated strains of rat typhus virus cannot be relied on in this respect. When employing this method a sharp distinction should be drawn between inoculation with a known typhus virus and inoculation with a substance which may or may not contain a typhus virus. In the first instance the indirect method may be sufficient, in the second only the direct method should be relied upon.

Instances of the correct and incorrect methods of carrying out such tests are given.

D. H.

RONSE (Marguerite). Adaptation du virus du typhus murin aux Lérots et aux Hérissons. [**Adaption of Murine Typhus Virus to Dormice and Hedgehogs.**]*—C. R. Soc. Biol.* 1934. Vol. 115. No. 7. pp. 754-756.

The author inoculated several dormice and found that they were susceptible to the virus of rat typhus. These animals did not suffer in any way and had no fever but their brains proved to be infective for guineapigs and the virus was passed in series through several of these small rodents. In one instance a positive Weil-Felix reaction was noted. The hedgehog was also shown to be susceptible and gave a positive Weil-Felix reaction.

D. H.

COMBIESCO (D.). Réaction de Weil-Félix chez les chiens de Constantza. [**Weil-Felix Reaction in Dogs at Constantza.**]*—C. R. Soc. Biol.* 1934. Vol. 115. No. 6. pp. 672-673.

Constantza is at present the only place in Rumania where bouton-neuse fever is met with, 34 cases in 1931, 3 or 4 in 1933. Many infected

ticks were found in various parts of the town in 1932 but only one human case; the author considers that the virulence of the disease may be lowered by the immunity of the local dogs on which these ticks feed.

The serum of 43 dogs was tested, a strain of OX19 was employed; 19 of the sera gave a positive reaction, 1/50 or more, the highest titre being 1/500. Of the sera of 30 dogs in Bucharest where no cases of the fever have occurred none gave a positive reaction. *D. H.*

- i. COMBIESCO (D.), POPESCO (C.) & VANTU. Typhus exanthématique expérimental chez le chien. [**Experimental Typhus in the Dog.**]—*C. R. Soc. Biol.* 1934. Vol. 115. No. 9. pp. 996-998.
- ii. ——. Réaction de Weil-Felix chez les chiens de Bessarabie. [**Weil-Felix Reaction in Dogs of Bessarabia.**]—*Ibid.* pp. 999-1000.

1. The authors have already shown that the dog is susceptible to the virus of typhus, both epidemic and endemic [see this *Bulletin*, Vol. 30, p. 891]. They now find that the virus can be passaged in these animals.

Dogs were inoculated intraperitoneally with an emulsion of the brain of infected guineapigs. The virus was passed through three series from dog to dog, and guineapigs inoculated from them gave a typical reaction. The serum of the dogs also showed a positive Weil-Felix reaction.

ii. The sera of 38 dogs were examined, from houses where cases of typhus fever had recently occurred. Two of these sera agglutinated OX19, one up to a dilution of 1/500 and one to 1/200, the other sera were negative, as also was agglutination with OX2; whereas in areas where boutonneuse fever occurred the sera of dogs agglutinated this strain as well as OX19. *D. H.*

BLANC (Georges), NOURY (M.) & BALTAZARD (M.). Sensibilité de l'écureuil de Gétulie *Xerus* (*Atlantoxerus*) *getulus* au virus du typhus murin de Casablanca. [**The Gétulie Squirrel Sensitive to the Virus of Murine Typhus in Morocco.**]—*C. R. Soc. Biol.* 1934. Vol. 115. No. 1. pp. 8-9.

This small rodent found in Morocco closely resembles the spermophile (*Citellus*) which has already been shown to be susceptible to the virus of boutonneuse fever and also to typhus virus. Great difficulty was experienced in keeping these animals alive in captivity but sufficient work was done to show that they are susceptible to the rat typhus virus and guineapigs were successfully inoculated from them.

D. H.

NICOLLE (Charles) & LAIGRET (J.). Faible sensibilité d'une chauve-souris (*Vespertilio kuhli*) à certains virus, exanthématiques. [**Susceptibility of Bats to Typhus Virus.**]—*Arch. Inst. Pasteur de Tunis.* 1933. Dec. Vol. 22. No. 4. pp. 491-498.

Bats are difficult to keep in captivity and require an enormous number of insects for food. A few young bats can be kept healthy if fed on milk. It was found that hibernating bats could be utilized if kept in the dark at a low temperature. These bats were inoculated with the virus and killed about the 12th day and emulsion of the

brain was inoculated into other bats and into guineapigs as test indicator animals. Positive results were obtained with the Mexican typhus virus and with Rocky Mountain fever but could not be passaged a second time. The susceptibility of these bats is therefore only slight.

D. H.

KRITSCHIEWSKI (I. L.) & SOLOWIOW (N. N.). Das Fleckfieber bei den wilden Ratten in Moskau. II. Mitteilung: Die Weil-Felix-Reaktion als Methode zur Feststellung des Flecktyphus bei Ratten. [**Typhus in Wild Rats in Moscow. The Weil-Felix Reaction as a Means of detecting Typhus in Rats.**—*Zent. f. Bakt.* I. Abt. Orig. 1934. Apr. 5. Vol. 131. No. 3/4. pp. 232-235.

The sera of 103 wild rats were tested against emulsions of Proteus X19 and 28 per cent. gave a positive reaction, that is in dilutions of 1/10 up to 1/500. Six of those which gave positive reactions were killed and the brains emulsified and injected into guineapigs; in one case a positive reaction was obtained, *i.e.*, fever and orchitis. [No mention is made of the presence of Rickettsia or proof of immunity by injection of a known typhus virus.] It is remarked that in the rats which did not infect, the positive Weil-Felix reaction was probably due to a previous attack of typhus in the rat.

The sera of 70 white rats kept in the Institute were then tested and 41 per cent. of these reacted positively in dilutions of 1/10 up to 1/200. One rat (1/200 positive) was killed and an emulsion made of the brain and injected into a male guineapig; after an incubation period of 13 days this animal developed fever and also orchitis. Five white rats (negative Weil-Felix) were inoculated with the virus of rat typhus, after 14 days the sera were tested and all but one gave a positive reaction 1/300; one of these rats was then killed and the brain emulsion inoculated into two guineapigs, both developed fever reaction.

D. H.

SUZUKI (K.). Untersuchung ueber Rickettsia-Infektion (sogenanntes Rattenfleckfieber-Virus) und Weil-Felix-Reaktion bei Ratten in Hamburg. [**Rickettsia Infection and Weil-Felix Reaction in Rats in Hamburg.**—*Zent. f. Bakt.* I. Abt. Orig. 1934. Apr. 5. Vol. 131. No. 3/4. pp. 236-240. [16 refs.]

Ten wild rats were captured in the port of Hamburg, one (*Mus rattus*) on board ship, 9 (*Mus norvegicus*) from various districts in the town.

Five of these rats gave a positive Weil-Felix reaction 4 with X19 and 1 with OX19 (*sic*). All 10 rats were killed and the brain emulsion inoculated into male guineapigs. Three of these gave a positive reaction. It is stated that in smears from the tunica vaginalis Rickettsia were found in some of the infected guineapigs but none of them were tested for immunity against a known virus.

D. H.

NICOLLE (Charles) & SPARROW (Hélène). Existence d'un virus typhique chez les rats de Tunis. Caractère de ce virus. [**Characters of a Typhus Virus from Tunis Rats.**—*C. R. Acad. Sci.* 1934. Apr. 9. Vol. 198. No. 15. pp. 1334-1336.

There are two methods of demonstrating the virus of a disease such as typhus in wild rats; the one is to inject into susceptible

laboratory animals an emulsion of the brains of several rats, the second to inject the emulsion of the brain of one rat at a time. Employing only the first method one is apt to get confusing results due to the presence of several different pathogenic agents in the group of rats.

The authors employed both methods and succeeded in isolating the typhus virus from the wild rats of Tunis by each. In the present note only the results obtained by the first method are detailed.

The rats were placed in groups of 5 and emulsions of the brains were, in each group, injected into 2 guineapigs. In all 174 wild rats were examined and 70 guineapigs were used in the tests. Five lots of 5 rats had been tested when the tests had to be abandoned owing to an outbreak of Paratyphus B infection among the laboratory guineapigs. In two instances the virus of typhus was isolated from rats; one strain was passaged 15 times and the other 10 times. Virus No. 1 when inoculated into white rats produced a short fever which was fatal in 25 per cent. of the animals; the serum of 50 per cent. of these rats gave a positive Weil-Felix reaction and also agglutinated the Rickettsia of epidemic typhus and of Mexican typhus. In guineapigs this virus gave rise to fever and also produced a marked swelling of the scrotum in all. Seven of the guineapigs which had had fever following injection of the Tunis rat virus were later tested with the virus of "historical" typhus virus and 6 of them proved to be immune; it was also shown that the Tunis rat virus protected guineapigs against the Toulon rat typhus virus. Out of 545 wild rats tested the serum of 3.5 per cent. gave a positive Weil-Felix reaction; but of the 5 rats composing the group from which virus No. 1 was isolated none gave a positive Weil-Felix reaction.

D. H.

NICOLLE (Charles). L'existence du typhus murin chez les rats de la région parisienne reste toujours à démontrer. [**Does Murine Typhus exist in Paris Rats?**—*Bull. Acad. Méd.* 1934. Feb. 27. 98th Year. 3rd Ser. Vol. 111. No. 8. pp. 299-304.]

In 1932 BRUMPT stated that he had been able to demonstrate the presence of the virus of typhus in the brains of rats captured in Paris and in the suburbs but only in one instance. [*This Bulletin*, Vol. 29, p. 773; *ante* p. 240.]

Professor Nicolle in 1933 examined the brains of 146 wild rats from the same localities but was not able to isolate the typhus virus; he is of opinion, as the title of this discussion suggests, that this virus has not yet been isolated in Paris.

BRUMPT refers to the work of LÉPINE in Athens, who showed that in the year 1932 the typhus virus (murine) could be easily obtained from the brains of rats caught in the city and also from fleas caught on these rats; but a year later over 400 rats had to be examined before the virus was found and more than 1,000 fleas.

D. H.

NICOLLE (Charles), GIROUD (Paul) & SPARROW (Hélène). Présence exceptionnelle du virus murin dans les urines des rats infectés expérimentalement par ce virus. [**The Occasional Presence of Typhus Virus in the Urine of Rats Experimentally Infected.**]—*C. R. Acad. Sci.* 1934. Jan. 29. Vol. 198. No. 5. pp. 414-416.]

A few drops of the urine of infected rats were instilled into the eye of guineapigs; 7 out of 21 developed fever but only one of these

proved to be immune when tested later with a known typhus virus. A similar result—positive in one case—followed when the urine was injected under the conjunctiva; but no reaction was obtained when it was inoculated subcutaneously or intraperitoneally. D. H.

NICOLLE (Charles), GIROUD (Paul) & SPARROW (Hélène). Présence exceptionnelle du virus typhique murin dans les urines des rats, infectés expérimentalement par ce virus. [**Exceptional Presence of Typhus Virus in Experimentally Infected Rats Urine.**]*—Arch. Inst. Pasteur de Tunis.* 1934. Mar. Vol. 23. No. 1. pp. 1–14.

Professor Nicolle again draws attention to the fact that when the organs or urine of wild rats is injected into guineapigs there are other germs than the typhus virus which may produce fever and even fever with orchitis in these animals. The presence of the typhus virus should only be considered as proved if certain tests are successfully carried out. The most important of these tests is (a) the presence of *Rickettsia* in the cells of the tunica and (b) a definite immunity to a test dose of a *known* typhus virus.

Three strains of rat virus were utilized in the present series of experiments, one a Mexican strain, the others from Toulon. Three methods of application were used: (a) The urine of infected rats was instilled into the conjunctiva of guineapigs and kept in contact for 8 minutes; (b) the urine was injected under the conjunctiva, (c) the urine was injected intraperitoneally. The urine of 93 rats was tested and of these only 2 proved positive, both with the Mexican virus, one by instillation, the other by subconjunctival injection, none by the intraperitoneal route. Seventy-four rats were infected with the Mexican virus and 19 with the European rat virus (none of these gave a positive reaction).

Although it is obvious from the results of these experiments that the amount of typhus virus in the urine of rats is very minute, still the possibility of infection by this route should be kept in mind, especially by those handling infected rats. D. H.

GAJDOS (E.) & TCHANG (J.). Le gonflement scrotal du cobaye dans le typhus exanthématique expérimental de Chine. [**Scrotal Swelling of Guinea-pigs in Experimental Typhus in China.**]*—Arch. Inst. Pasteur de Tunis.* 1934. Mar. Vol. 23. No. 1. pp. 37–42.

Two strains of typhus virus are maintained in the Peking laboratory, both from cases of the disease in man, one from a Chinese in Mongolia and one from a European in Peking.

Both these strains have already been shown to produce fever and swelling of the scrotum when inoculated into guineapigs. The scrotal reaction appears on or about the first day of the fever, lasts for 3 or 4 days and then completely disappears. *Rickettsia* were not discovered in the fluid from the swollen scrotum but at post-mortem when smears were made from the inflamed tunica and stained *Rickettsia* were readily demonstrated. The scrotal reaction did not appear in all infected guineapigs; with virus N about 50 per cent. were positive, with virus P about 30 per cent. After a certain number of passages the reaction becomes less and less and finally is only occasionally seen, and when it does occur is much milder in character, the febrile

reaction however remaining as before. This change in the scrotal reaction occurred at the 14th passage with strain N and at the 15th passage with strain P; the reaction completely disappeared after the 37th passage in both cases. D. H.

D'AUNOY (Rigney) & FINE (Archie) **Influence of Rabie Virus on the Agglutination of *Proteus* X19 Organisms.**—*Jl. Trop. Med. & Hyg.* 1934. Mar. 1. Vol. 37. No. 5. pp. 65-66.

It has been stated that severe cases of typhus with pronounced nervous symptoms may simulate rabies. The authors tested the serum of rabbits, which were suffering from rabies due to fixed and street virus, against *Proteus* X19 but none of the sera gave a positive reaction. The sera of patients who were undergoing or had just undergone prophylactic inoculation for rabies were also tested but all gave a negative Weil-Felix reaction; as did the sera of two men who were actually suffering from rabies. D. H.

ZINSSER (Hans) & CASTANEDA (M. Ruiz). **Active and Passive Immunization in Typhus Fever.**—*Proc. Nat. Acad. Sci.* 1934 Jan. Vol. 20. No. 1. pp 9-11.

— & —. **Studies on Typhus Fever. XII. The Passive Immunization of Guinea Pigs, infected with European Virus, with Serum of a Horse treated with Killed *Rickettsia* of the Mexican Type.**—*Jl. Experim. Med.* 1934. Apr. 1. Vol. 59. No. 4. pp. 471-478. With 3 charts.

In a previous paper the authors showed that the serum of a horse, immunized by killed *Rickettsia* of Mexican typhus, protected guinea-pigs against the homologous virus but not against the virus of European typhus [this *Bulletin*, Vol. 30, p. 887]. However, they now show that if the serum is given 3 or 4 days after the dose of virus then there is abundant evidence of protection against the European virus also. Their experiments show that the serum of a horse treated with Mexican *Rickettsia* acquires a Weil-Felix reaction, agglutinates the European louse vaccine and protects against the European virus. D. H.

NICOLLE (Charles), LAIGRET (Jean) & SPARROW (Hélène). **Vaccination contre les typhus exanthématiques par voie digestive chez le singe. [Vaccination of Monkeys against Typhus by the Digestive Route.]**—*C. R. Acad. Sci.* 1933. Dec. 26. Vol. 197. No. 26. pp. 1709-1711. Also in *Arch. Inst. Pasteur de Tunis.* 1934. Mar. Vol. 23. No. 1. pp. 15-18.

An attempt was made to immunize monkeys against typhus virus by feeding them on the brains of infected guinea-pigs. Three strains of virus were employed, a rat typhus virus, a true typhus virus, and a virus of Rocky Mountain fever. Of 8 monkeys which were fed on typhus infected brains 4 proved to be immune when subsequently tested. No immunity was produced in the case of Rocky Mountain fever. Incidentally it has been shown in two instances that the ingestion of the brain of guinea-pigs infected with rat typhus virus is innocuous for man. D. H.

VARELA (Gerardo) & PARADA GAY (Miguel Angel). Préparation du vaccin contre le typhus exanthématique. [**Preparation of Vaccine against Typhus.**—*C. R. Soc. Biol.* 1934. Vol. 115. No. 13. pp. 1465-1466.]

The authors employ the method of MOOSER to obtain large numbers of Rickettsia. Rats are inoculated intraperitoneally with the testicular washings from infected guineapigs and injections of fresh blood are made at the same time and daily for 4 or 5 days. Large numbers of Rickettsia are found in the cells lining the peritoneal cavity of the rat and also free in the exudate. The fluid from the peritoneum and scrapings from the wall are collected and emulsified in 2 per cent. formalized citrate solution; this is centrifuged and the precipitate washed several times and finally triturated in a mortar and suspended in 0.2 per cent. formalized citrate solution. The vaccine is standardized by staining the fluid and noting the number of Rickettsia per cc.

D. H.

TZEKHNOWITZER (M. M.) & PALANT (B. L.). Die Neurovaccine bei Flecktyphus im Experiment. [**Neurovaccine in Experimental Typhus.**—*Zent. f. Bakt.* I. Abt. Orig. 1933. July 11. Vol. 129. No. 1/2. pp. 69-80.]

The authors refer to the work of NICOLLE & SPARROW, who attempted to protect animals and man by means of a living vaccine (emulsion of the brain of infected guineapigs).

The authors prepared a vaccine on the same lines from local strains of typhus virus and the minimal lethal dose for guineapigs was determined. Three trials were made on guineapigs with this vaccine, one with living vaccine, one with vaccine killed by carbolic, and one with vaccine killed by formalin. Of the living vaccine only one dose was given but with the others four at intervals. The best results were obtained with the formalin killed vaccine; out of 8 immunized guineapigs only one developed fever when tested one month later, whereas 3 controls all contracted fever. As a further control 8 guineapigs were given emulsion of brain of normal guineapigs; 4 received 4 doses and 4 ten doses. When tested one month later all developed fever, thus showing that the protection afforded by the vaccine is due to a specific antigen.

D. H.

FLETCHER (William). Typhus tropical et maladies de la même famille. [**Tropical Typhus and Diseases of the Same Group.**—*Bull. Office Internat. d'Hyg. Publique.* 1934. Jan. Vol. 26. No. 1. pp. 95-110. [64 refs.]

A report of these typhus-like diseases was submitted to the Permanent Committee of the Office International about 4 years ago and the present report brings the subject up to date.

The report is divided into sections. The first dealing with the classification of the diseases, another with typhus in rats and rat fleas and another with Rickettsia in association with the virus in animals and in insects. The present views in regard to the Weil-Felix reaction are given and also a résumé of recent researches in British Colonies. The reporter is now inclined to the view that "scrub typhus" of Malaya is identical with Japanese River fever and that "shop typhus" is endemic typhus or Brill's disease; the first carried by a larval mite,

a common parasite of rats in the palm oil and rubber plantations; and the second by the rat flea, *X. cheopis*, a common parasite of rats in the shops in towns and especially in grain stores. D. H.

PORTELLY (J.). **A Review of Tropical Typhus in Negri Sembilan.**—*Malayan Med. Jl.* 1933. Dec. Vol 8. No. 4. pp. 253-256.

A series of 84 cases of tropical typhus was reported in Negri Sembilan over the period February 1930 to August 1933.

Only 15 of these cases were definitely diagnosed as of the W or urban type, the others were of the K or scrub type. The serological results agree with the occupation of the patients, nearly all the K type cases being among coolies on estates, the W type including clerks, shop keepers, engine drivers, etc., mostly urban dwellers. D. H.

VITALIS (F.). Een geval van tropical typhus te Koedoes. [**A Case of Tropical Typhus at Koedoes, Java.**]—*Geneesk. Tijdschr. v. Nederl.-Indië*, 1934. Jan 2. Vol. 74. No. 1. pp. 52-56.

A record is given here of the occurrence of a case of "shop-typhus" with a full account of the clinical history. As is common in these cases the diagnosis was not made immediately and those of dengue and typhoid were first considered. The proof that the case was one of typhus was given by the positive serum agglutination reaction with *Proteus* OX19 at 1/800. This reaction was negative for the Kingsbury strain. W. F. Harvey.

BRIDGES (R. F.). **Tropical Typhus and the Weil-Felix Reaction.**—*Jl. Roy. Army Med. Corps.* 1934. Feb. Vol. 62. No. 2. pp. 102-106.

Such a paper as this, which gives full and detailed instruction regarding the principles and the methods of carrying out the Weil-Felix reaction, was wanted not only in India and is well done.

There has often been little uniformity in carrying out the test, one reason being that *Proteus* cultures of pure O type were often not obtainable and when available were not reliable. It is now proposed to issue stock emulsions of 3 strains of *Proteus*, X19, X2 and XK, from the laboratory at Kasauli. The author also urges anyone who may have a case of tropical typhus under his care to make every effort to isolate a strain of *Proteus* from the blood or urine and to test such a strain against the serum of the patient and against specific sera which are to be supplied from the Central Laboratory along with the cultures.

If the instructions in the paper are carefully followed it may be found that there are 3 types of typhus in India :—1. Epidemic typhus (louse borne). 2. Endemic typhus (flea borne). 3. Tick typhus (tick borne); the last variety being closely related to the Eastern type of Rocky Mountain fever and to boutonneuse fever of Southern Europe and North Africa.

[It is not generally known that boutonneuse fever has already been described as such in India; see this *Bulletin*, LINDBERG, Vol. 29, pp. 19 & 458.] D. H.

VIEIRA (Francisco Borges) & MESQUITA (Mario). Alguns aspectos epidemiológicos do "tifo exantemático de S. Paulo." [**Some Epidemiological Aspects of São Paulo Typhus.**—Reprinted from *Rev. Hyg e Saúde Publica*. 1934. Jan. pp. 1-25. With 4 figs. & 1 map. [15 refs] [Issued as Boletim No. 51 do Inst. de Higiene, São Paulo.]

The incidence and case fatality of typhus at São Paulo from October 1929 to October 1933 was as follows.—

			Cases	Deaths	Fatality
					Per cent
1929	...	...	15	14	93.3
1930	...	...	21	14	66.6
1931	...	...	28	19	67.8
1932	...	...	15	11	73.3
1933	...	...	9	8	88.8
			88	66	75.0

Each year the highest incidence was in November (25 of the 88 cases). Lice or any other ectoparasites were exceptional. Only 10 per cent. showed head or body lice and 43 per cent. showed none, while no information was forthcoming in 53 per cent. 50 patients were males and 38 females. The ages ranged from 2 to 74, but the highest proportion (12 cases) were found in the age period 10-14. The cases were mainly confined to certain parts of the city, preferably the suburban areas. Most of the cases occurred in houses bordering on untilled soil or woodland. In contrast with the sporadic character of endemic typhus this concentrates in certain zones, as is frequently observed in Rocky Mountain spotted fever of which São Paulo typhus is probably a variety.

J. D. Rolleston.

MONTEIRO (J. Lemos). Etude comparative du "typhus exanthématique de Sao Paulo" (rickettsiose néotropical) et du "typhus exanthématique" d'autres lieux, basée sur l'épreuve de protection par le sérum de convalescent. [**Comparative Study of Sao Paulo Typhus and True Typhus based on Protection Tests with the Serum of Convalescents.**]—*C. R. Soc. Biol.* 1934. Vol. 115. No. 12. pp. 1360-1362.

The serum was obtained from a case of true typhus in the Argentina and was mixed with Sao Paulo virus (blood of guineapigs taken at height of fever) 0.5 cc. of serum and 0.1 cc., 0.25 and 0.4 cc. of guineapig blood containing virus. No. 1 serum only protected against the minimal dose of virus. Control guineapigs, virus only, all died. Similar tests using the virus of Rocky Mountain fever gave a like negative result.

D. H.

DAVIS (Gordon E.) & PARKER (R. R.). **Comparative Experiments on Spotted Fever and Boutonneuse Fever.**—*Public Health Rep.* 1934. Mar. 30. Vol. 49. No. 13. pp. 423-428. With 2 charts.

The authors and others have already shown that there is definite cross immunity between the viruses of Rocky Mountain fever and of

boutonneuse fever and between Rocky Mountain fever and Sao Paulo fever; but although Rocky Mountain fever vaccine protects guinea-pigs against Sao Paulo fever, the work presented in the present paper shows that Rocky Mountain fever vaccine does *not* protect against the virus of boutonneuse fever. D. H.

JELLISON (William L.). **Rocky Mountain Spotted Fever. The Susceptibility of Mice.**—*Public Health Rep.* 1934. Mar. 16. Vol. 49. No. 11. pp. 363-367.

The opinion is generally held that small mammalian hosts of ticks act as reservoirs of infection for Rocky Mountain fever. Previously it was thought that mice were not susceptible to the virus. But this paper clearly shows that the "meadow" mouse is extremely susceptible to the virus and the "deer" mouse slightly susceptible; as the meadow mouse is an important host of the tick *D. variabilis* it is possible that this small mammal may play a considerable part in the natural maintenance and spread of the disease. House mice were distinctly resistant to the virus. D. H.

DAVIS (Gordon E.), PARKER (R. R.) & WALKER (Mary E.). **Further Observations on the Agglutination of Proteus X Strains in Rocky Mountain Spotted Fever (II).**—*Public Health Rep.* 1934. Mar. 2. Vol. 49. No. 9. pp. 298-311.

The sera of 81 cases of fever were tested in this investigation and 13 strains of *Proteus* X were used. All but 3 of X19 strains were H variants. In 57 cases only single samples were tested. The results are fully set out in tables. The results of H type agglutinations are not recorded.

OX19 (504) a pure O antigen gave the following results: Of 27 samples taken during the first 9 days of illness 37 per cent. gave a positive reaction of 1/160 or higher. Of 31 samples taken from the 10th to the 15th day 83 per cent. showed significant agglutination all above 1/160 and as high as 1/5120. Of 26 samples taken from the 16th to the 26th day 80 per cent. showed a significant titre.

The use of the strain OXK gave the following results: out of the 100 samples of sera tested at various periods during illness and convalescence only one gave a definite positive reaction up to a dilution of 1/320.

It is recommended that in carrying out agglutination tests on Rocky Mountain fever cases 3 samples of serum should be taken, one as early as possible in the disease, the second during the period from the 10th day of illness to cessation of fever, and the 3rd about the end of the first week of convalescence. The authors prefer to use emulsions of living bacilli and the tests should be left 48 hours before reading results.

D. H.

BREINL (F.). **Versuche zur Züchtung des Felsenfiebertvirus in vitro. [Cultivation of the Virus of Rocky Mountain Fever in Vitro.]**—*Zent. f. Bakt.* I. Abt. Orig. 1933. Dec. 29. Vol. 130. No. 5/6. p. 316-319.

The medium employed consisted of cells of chick embryo emulsified and mixed with virus obtained from the testicle of guinea-pigs with

high fever, inoculated into 3 cc. of tyrode solution + 1 cc. normal rabbit serum.

After 7 days incubation at 35°C. 1 cc. of the fluid with some tissue cells was removed; one part of this was utilized to make subcultures and one part injected into guineapigs. The results are shown in graphic form.

In 1/3 of the cases successful culture resulted and in one series the culture was kept alive through 7 subcultures; in each case the virus was shown to be infective for guineapigs. In none of the cultures were *Rickettsia* observed.

D. H.

ANDRÉOLI & CHARLET. Fièvre boutonneuse et troubles oculaires. [*Boutonneuse Fever and Eye Symptoms.*]—*Bull. Acad. Méd.* 1934. Mar. 6. 98th Year. 3rd Ser. Vol. 111. No. 9. pp. 338–347.

A number of cases of boutonneuse fever have been reported in which the site of inoculation of the virus is the conjunctiva; they are usually due to rubbing the eye with a finger contaminated by crushed dog ticks. 20 such cases are analysed by the authors, who regard them mainly from the oculist's point of view.

The average incubation period was 3 days; the rash appears on or about the 5th day after the commencement of the conjunctivitis, which may last for 8 days but a redness may be noted up to one month; there is oedema of the eyelid with suppuration in the culs-de-sac and inflammation of the lymphatics leading to the preauricular lymphatic glands. The conjunctivitis is as a rule one-sided. The disease following is generally but not always of a severe type especially as regards the nervous symptoms.

The oculist is called in to see the patient at first and the physician later when the fever and rash appear; oculists therefore should be on the outlook for such cases especially in endemic areas.

D. H.

PREVITERA (Antonino). Ricerche sperimentali in alcuni casi di tifo esantematico benigno endemico in Catania. [*Experimental Researches in Cases of Mild Endemic Typhus.*]—*Ann. d'Igiene.* 1934. Mar. Vol. 44. No. 3. pp. 212–224. With 2 charts. [11 refs.]

A record of two cases in adults of mild endemic typhus corresponding to the summer typhus described by OLMER and others as occurring in the Marseilles district and on the Mediterranean coast. Their blood was inoculated into guineapigs with the following results: (1) All showed a rise of temperature and three out of six had a scrotal reaction visible to the naked eye during life in one animal, and on histological examination post mortem in the other two. (2) The virus was transmissible in series up to the fourth passage without becoming attenuated. (3) Inoculation did not produce any immunity, as two animals showed a marked rise of temperature when injected, again, the one 45 days and the other 32 days after the first inoculation. (4) The Weil-Felix reaction was constantly negative and *Rickettsia* could not be found in the inoculated animals.

J. D. Rolleston.

LEMIERRE (A). Eruptive Mediterranean Fever.—*Lancet*. 1934. Mar. 3. pp. 441-443. [24 refs.]

An address delivered at the Middlesex Medical Society, January 23rd. Professor Lemierre describes a case of "Eruptive Mediterranean Fever" which came under his observation in the American Hospital in Paris; this man had been infected by the bite of dog ticks while in Italy and developed the disease 12 days later on his arrival in Paris. The remainder of the address consists of an able review of recent work on this disease carried out in France, Italy and elsewhere; all the articles referred to have been already summarized in this *Bulletin*.

[It is rather disappointing (especially to the reviewer) that Professor Lemierre has no better English name for this disease than "Eruptive Mediterranean Fever"; in one place also he refers to the disease as "Mediterranean" fever, which must be confusing to English readers as this is or was a common name for "Malta fever"] D. H.

MONTEIRO (J. Lemos). A propos de la *Rickettsia mooseri* [*R mooseri*].—*C. R. Soc. Biol.* 1934 Vol. 115. No. 12 pp. 1358-1359.

WEIGL and NICOLLE recently proposed the name *Rickettsia mooseri* for the organisms found in animals and insects infected with the virus of Mexican typhus fever (*ante*, p. 244); Monteiro points out that he had suggested this name in a paper published some months earlier. D. H.

LEMIERRE (A.) Sur un cas de fièvre boutonneuse méditerranéenne observé à Paris.—*Bull. et Mém. Soc. Méd. Hôp. de Paris* 1934 Feb. 5. 50th Year. 3rd Ser. No. 3. pp. 106-109.

LEMOINE & LE MER. Sur un cas de fièvre boutonneuse.—*Tunis Méd* 1934 Feb. Vol. 28. No. 2 pp. 43-47.

PLAZY, MARCANDIER & PIROT. Fièvre boutonneuse dans le milieu maritime à Toulon.—*Arch. Méd. et Pharm. Nav.* 1934 Jan.-Feb.-Mar. Vol. 124 No. 1. pp. 80-92. [16 refs.]

SCADUTO (Pasquale). Un caso di febbre esantematica mediterranea nei dintorni di Tripoli.—*Arch. Ital. Sci. Med. Colon.* 1934 Mar. 1 Vol. 15 No. 3 pp. 173-179. English summary (3 lines).

SCATURRO (Alberto). La febbre bottonosa. Rivista sintetica e casi personali.—*Riv. Sanitaria Siciliana*. 1934 Mar. 15. Vol. 22. No. 6 pp. 433-436, 439-442. English summary (3 lines).

RABIES

A REVIEW OF RECENT ARTICLES. XXI.*

1. *Virus.*

By a very ingenious method of technique it would appear that NICOLAU and KOPCOWSKA¹ have succeeded in retransforming fixed virus into street virus. The strain of fixed virus used had been passaged in the laboratory for 6 years, and gave rise to from 1 to 4 Negri bodies in 100 ganglion cells of the horn of Ammon. The transformation was achieved by passage inoculations made into the *right* sciatic nerve, the emulsions employed being obtained from the *left* sciatic nerve of the previous animal. A control animal was inoculated intracerebrally at each subpassage. With a great deal of trouble two lines of passage have been obtained covering a period of more than a year. "If one judges by the number and size of the Negri bodies, which from the 4th or 5th passage from nerve to nerve are found on the hippocampi of the control animals, then we may be permitted to affirm, from this moment, that the transformation of fixed into street virus is possible." The numbers of Negri bodies in the control animals inoculated from the 2nd, 3rd, 4th, and 7th passages were 11, 62, 17 and 102 per 100 neurones in one series, and 28, 21, 160 and 92 in the other. In addition, in the spinal ganglia of the animals of the 3rd, 5th and 6th passages the numbers in one series were 209, 208, and 168 per 100 neurones, and in the 3rd and 4th passages of the other series 300 and 152.

The rôle of the vampire bat in the transmission of rabies both of man and of cattle has been referred to on various occasions in previous reviews (Vol. 29, pp. 595 and 596). LIMA² presents further evidence in support of the view that this animal, *Desmodus rotundus*, is the transmitter of the epizootics in the Matto Grosso region of Brazil. He refers to experiments which show that vampire bats fed on infected cattle do not become infected. Of a number of uninfected bats kept in the same cage as a number of infected bats, one developed the disease, and in a third experiment four infected bats remained in health though at the same time they transmitted infection to 25 cattle. One of the bats was killed and its salivary gland was found to be infective to guineapigs. A vampire bat may therefore harbour infection, and be capable of transmitting it, without showing any symptoms of rabies. It is well known that those regions of the State of Santa Catharina in which epizootics are prevalent are also the favourite haunts of the Desmodontidae. The author concludes from his observations and experiments that it may be taken as "decisively and completely proved" that in the epizootics of rabies in Santa Catharina the transmitter is the vampire bat (*Desmodus rotundus*).

*For the twentieth of this series see Vol. 31, p. 145.

¹ NICOLAU (S) & KOPCOWSKA (L.). Sur la transformation du virus rabique fixe en virus des rues.—*C. R. Acad. Sci.* 1934 Feb. 5. Vol 198 No. 6 pp. 622-624.

² LIMA (Esperidião de Queiroz). A transmissão da raiva bovina pelo morcego hematophago *Desmodus rotundus*.—*Brasil-Médico* 1934. Jan. 20 Vol. 48. No. 3. pp 38-40.

LEVADITI, SCHOEN, and LEVADITI³ have carried out experiments designed to determine what is the ultimate fate of Negri bodies introduced into the receptive tissues of a fresh animal. Thus a thick emulsion of brain, rich in Negri bodies, was injected into the anterior chamber of the eye. The animals injected were examined from 24 hours up to the time of death, and the tissues at the site of inoculation have been examined histologically. It appeared that the inoculated neurones degenerated, and that at no time could one detect the presence of Negri bodies.

"The evolution of the Negri bodies ceases at the moment of injection, which appears to show that their life is ephemeral and intimately associated with that of the neurones which harbour them. The most plausible hypothesis is that the Negri bodies resolve themselves into infra-visible elements which invade the nervous system and multiply in it. After penetrating certain neurones they develop into the visible phase of the cycle of evolution, the Negri body."

The effect of pH on the virulence of fixed virus has been studied by KOLDAJEW and PIKUL⁴. The investigation was carried out on 649 rabbits, of which 308 developed the disease. The result is shown by a graph, from which it appears that the optimum pH lies between 6.4 and 7.0. By changing the pH the persistence of virulence is reduced, falling more quickly as acidity increases, and more slowly as alkalinity increases. This loss of virulence is probably an irreversible phenomenon.

SHORTT and BROOKS⁵ have extended CLIFTON's work on the photodynamic action of methylene blue on Bacteriophage, to the virus of rabies. The dilutions of the dye which were employed were 1 in 10, 20 and 200 thousand. These were added to the supernatants of suspensions of fixed virus brain tissue, centrifuged until they were opalescent. Certain mixtures were exposed to daylight for from 2 to 60 minutes, others were kept in the dark room.

It was found that after 10 minutes exposure all three dilutions of methylene blue completely inactivated the virus; and that the lowest dilution of the stain was less effective than the two higher dilutions. This latter result is in agreement with "the experiments of PERDRAU and TODD, which showed the inactivating effect of a screen of methylene blue" upon the penetration of the light. The protective action of homologous living cells which has been described in the case of the viruses of herpes, Borna disease, and fowl plague was not observed, "and this fact brings rabies fixed virus into line, so far as this character is concerned, with the viruses of louping ill and vaccinia."

A communication of a very similar nature is made by GALLOWAY⁶. He has shown that the photodynamic action of methylene blue

³ LEVADITI (C.), SCHOEN (R.) & LEVADITI (Jean). Cycle évolutif du virus rabique.—*C. R. Soc. Biol.* 1934. Vol. 115. No. 13. pp. 1502-1504.

⁴ KOLDAJEW (B.) & PIKUL (N.). Ueber den Einfluss der H-Ionenkonzentration auf das Virus fixe der Tollwut.—*Zent. f. Bakt.* I. Abt. Orig. 1934. Feb. 28. Vol. 131. No. 1/2. pp. 6-9. With 1 fig.

⁵ SHORTT (H. E.) & BROOKS (A. G.). Photodynamic Action of Methylene Blue on Fixed Rabies Virus.—*Indian J. Med. Res.* 1934. Jan. Vol. 21. No. 3. pp. 581-585.

⁶ GALLOWAY (I. A.). The "Fixed" Virus of Rabies: the Antigenic Value of the Virus Inactivated by the Photodynamic Action of Methylene-Blue and Proflavine.—*Brit. J. Experim. Path.* 1934. Apr. Vol. 15. No. 2. pp. 97-105.

inactivates fixed rabies virus in collodion membrane or sand and paper pulp filtrates, but not in unfiltered suspensions. The virus appears to be relatively more sensitive to the photodynamic action of proflavine than to that of methylene blue. It is shown that when inactivated the virus retains its antigenic potency since 26 out of 31 rabbits (84 per cent.) which had received more than one dose of such a vaccine survived an intramuscular test dose of fresh virus, while of 16 unvaccinated control animals only 1 survived (6 per cent.).

Much has been written of late years on the pseudorabies of AUJESKY. REMLINGER and BAILLY⁷ now contribute an admirable summary based to a large extent upon original experiments. They have investigated the disease in rabbit, cat, dog, jackal, hedgehog, mouse, guinea-pig, pig, hen, goose, duck, pigeon, buzzard and hawk. The modes of infection have been examined in detail. They show that transmission may occur by inoculation on the mucous membranes, inoculation on or into the skin, or by ingestion. The disease is described in detail and in a tabular summary its main features are contrasted with those of true rabies.

TRAUB⁸ has succeeded in cultivating the virus of pseudorabies in the presence of living tissue. The fact that the virus failed to multiply in tissue which had been stored in the refrigerator for more than 6 days prior to inoculation with the virus, and in cell-free 20 per cent. rabbit testicle extract, suggests that living cells are necessary for its growth. Growth has been obtained in media containing rabbit or guinea-pig testicle or chick embryo tissues. Rabbit testicle tissue gave the best results both as to regularity of the multiplication of the virus and the concentration the virus attained in cultures. The chick embryo medium, however, is the simplest, as it does not require serum, while the testicle media must contain a certain amount of homologous serum to ensure multiplication of the virus. In rabbit kidney tissue pseudo-rabies virus could not be grown.

The testicular medium is prepared as follows. 100 to 150 mgm. of testes washed in saline and minced, is placed in 50 cc. flasks. Two cc. of serum and 2 cc. of Tyrode solution prepared according to the formula of Fischer are added. The flask is shaken, and plugged with cotton wool covered by a layer of tinfoil. To prepare the chick embryo medium, 10-day embryos are cut up and mixed with scissors, after the eyes have been removed, and 100-150 mgm. of pulp is suspended in 3 cc. Tyrode solution to 1 cc. sheep serum. (It appeared in later experiments that the presence of sheep serum was not necessary).

The pathogenic properties of the virus were not altered during 49 serial cultural passages, and there were merely quantitative differences between the cultivated virus and rabbit brain passage virus.

It is stated that in sections of rabbit testicular cultures incubated for 1 day no inclusion bodies were apparent, whereas after 2 and 3 days they were seen in the interstitial cells of Leydig, in endothelial cells

⁷ REMLINGER (P.) & BAILLY (J.). Contribution à l'étude du virus de la "maladie d'Anjeszky."—*Ann. Inst. Pasteur* 1934. Apr. Vol. 52. No. 4. pp 361-405.

⁸ TRAUB (Erich). Cultivation of Pseudorabies Virus—*Jl. Experim. Med.* 1933. Dec. 1. Vol. 58. No. 6. pp. 663-681. With 3 figs. on 1 plate. [21 refs.]

of capillaries, and in connective tissue cells of the lamellar membranes of the tubules but not in the seminiferous epithelial cells. After four days these were no longer distinct

ii. *Symptomatology and Diagnosis.*

A case of hydrophobia presenting no unusual features is described by GUPTA.⁹

ZOTTNER¹⁰ recommends the following as a simple and rapid method for staining Negri bodies.—

- (1) Paraffin removed by xylol: wash in absolute alcohol.
- (2) Without washing, cover the section with a few drops of nitric acid (1/3): leave for 2 or 3 minutes, pour off the acid solution.
- (3) Without washing pour on a few drops of Ziehl's fuchsine, 15 seconds.
- (4) Wash quickly, and apply for 15 seconds a freshly prepared mixture of equal parts of saturated picric acid (aqueous solution) and 1 per cent. indigo carmine
- (5) Dehydrate and differentiate in absolute alcohol. When the sections commence to take on a green tint, clear with xylol and mount.

The Negri bodies are stained red, the neuroglia green, protoplasm green or green violet, nucleoli and chromatin granules dark brown.

iii. *Pathology.*

From a series of 6 experiments on 19 animals REMLINGER and BAILLY¹¹ find that the rabies virus can be detected in the lung "rarely but not exceptionally" (6 times in 19, *i.e.*, 32 per cent.). This proportion is similar to that formed for the spleen (28 per cent.), the liver (30 per cent.) and the kidney (30 per cent.)

The view that rabies antibodies are formed in the brain, led to the attempt to immunize by intracerebral inoculation. It was found by REMLINGER and BAILLY (this *Bulletin*, Vol. 26, p. 222) and by LOFFLER and SCHWEINBURG (*loc. cit.*, Vol. 28, p. 745) that such a method of treatment gave rise to no immunity. The latter authors then presented evidence that the site of antibody formation was the reticulo-endothelial system (this *Bulletin*, Vol. 30, p. 138), and that blocking of this system reduced protection. They now¹² present further evidence in favour of the reticulo-endothelial theory, and show that a previously established immunity can be rendered ineffective by blocking. The rabicidal antibodies are however not reduced by blocking. The experiments were carried out on 26 rabbits, the results are clear cut, and in each case the observation was controlled.

It will be remembered that MARIE in his later experiments (see this *Bulletin*, Vol. 30, p. 579) found that though even large doses of fixed virus did not infect the guineapig when introduced intraperitoneally, previous injection with Indian ink emulsion rendered

⁹ GUPTA (Rabindar Chandra Das) A Case of Hydrophobia after Preventive Inoculation.—*Indian Med. Gaz.* 1934. Feb. Vol. 69. No. 2. p. 81

¹⁰ ZOTTNER (G.). Coloration simple, sûre et rapide des corpuscules de Negri dans les coupes.—*C. R. Soc. Biol.* 1934. Vol. 115 No. 6. pp. 593-594

¹¹ REMLINGER (P) & BAILLY (J.). Sur la présence du virus rabique dans le poulmon.—*Bull. Acad. Méd.* 1934. Jan 30 98th Year. 3rd Ser. Vol. 111. No. 4. pp. 159-164

¹² LÖFFLER (Ernst) & SCHWEINBURG (Fritz) Beitrag zur Theorie der Immunität bei Tollwut.—*Zent. f. Bakt.* I. Abt. Orig. 1933. Dec. 29. Vol. 130. No. 5/6. pp. 329-334. [10 refs.]

them susceptible. Further observations on this subject are submitted by PATTO and CARNEIRO¹³. From experiments carried out with the viruses of rabies, and of Aujeszky's pseudo-rabies, they conclude that subcutaneous, intravenous, and even intraspinal injections of the blocking dyestuff causes the immunity of vaccinated animals to disappear, and further that the virulence of pseudo-rabies is greatly enhanced by simultaneous injections of Nankin ink. It was also found that the complement content of the serum of blocked animals fell slightly after an interval of 2 hours, and returned to normal after 24 hours. The authors then go on to describe their experiences with crossed precipitation tests, with which they obtained results specific for the two viruses.

A similar result has been attained by MARIE¹⁴. Using Indian ink, all of 12 blocked guineapigs died of rabies, whereas of 12 unblocked only 2 developed the disease, and using Van Deinse's mixture, 3 of 6 blocked, and none of 6 unblocked succumbed.

That Negri bodies may be found in the sympathetic nerve ganglia scattered throughout the salivary glands was pointed out by MANOU-ÉLIAN and VIALA (thus *Bulletin*, Vol. 25, p. 707). Other conformations not confined to ganglion cells have from time to time been described by these and other authors. SHORTT and LAHIRI¹⁵ have made an extensive study of salivary glands from dogs, monkeys, and man, and whilst they confirm the existence of Negri bodies within ganglion cells, they come to a different conclusion regarding many of the other structures which have been described.

Many curious appearances were seen in the acinar cells, some granular, some like Negri bodies with inner formations, but these, in the view of the authors, are characteristic of hyperstimulation of the gland, and are not directly indicative of the presence of a living virus, although the latter is probably the cause of the stimulation in rabies. For example, bodies which stained red with Mann's stain are considered to be of the nature of coagulated secretion or its precursors, and these have actually been produced experimentally by the exhibition of pilocarpine. The final conclusion of the authors is that (apart of course from inclusion bodies in nerve cells) "no evidence was obtained of the visible presence of any bodies which could be identified as bacteria, protozoa, or filterable viruses, or indeed of any living causative agent."

The paper should be studied in detail by those who are interested in the histology of rabies.

Observations on the rate of dissemination of rabies virus introduced into a sciatic nerve are described by NICOLAU and KOPCOWSKA.¹⁶

¹³ PATTO (Ortiz) & CARNEIRO (J. M.). Questões de imunidade na raiva e na pseudo-raiva.—*Brasil-Médico*. 1933. July 8. Vol. 47. No. 27. pp. 474-480. [46 refs.] English summary.

¹⁴ MARIE (A. C.). De l'infection rabique par la voie péritonéale.—*Ann. Inst. Pasteur* 1934. Feb. Vol. 52. No. 2. pp. 141-145. [11 refs.]

¹⁵ SHORTT (H. E.) & LAHIRI (B. N.). Morphological Studies on Rabies Part I. The Salivary Glands.—*Indian Jl. Med. Res.* 1934. Jan Vol 21. No. 3. pp. 587-604. With 23 coloured figs. on 2 plates.

¹⁶ NICOLAU (S.) & KOPCOWSKA (L.). Etude de la dispersion, dans le système nerveux du lapin, du virus rabique des rues inoculé dans un nerf périphérique.—*C. R. Soc. Biol.* 1934. Vol. 115 No. 3. pp. 262-264. With 1 fig.

It appears from these that the virus arrives simultaneously in the medulla and in the opposite sciatic nerve about the 7th day after inoculation.

iv. *Methods of Treatment and Statistics.*

Successful results have been obtained by PROCA, BOBES, and JONNESCO¹⁷ in the preventive serotherapy of rabies. The results of their experiments are as follows.—

		Treated			Controls		
		Survived	Died	Total	Survived	Died	Total
Series A	..	2	0	2	0	2	2
B	...	3	1	4	2	2	4
C	...	2	2	4	1	3	4
D	..	4	1	5	2	3	5
		11	4	15	5	10	15

In series A and B the infecting dose was 0.2 cc. of a 1/10 emulsion of fixed virus injected into the sole of the foot. 3 cc. of sheep antirabic serum (with a neutralizing titre of 1 to 1) was immediately thereafter injected into the flank of the same side.

In series C the dose of serum was given 24 hours before the infecting dose, whilst in series D, 5 cc. of serum were inoculated immediately after the infecting dose, a similar dose being administered 24 hours later, and doses of 2 cc. were given intramuscularly for a further period of a week. It would thus appear that the antirabic serum had a definite preventive action.

In a second communication¹⁸ they describe experiments on rabbits and mice in which the infecting dose was introduced into the tail. It appeared that under these conditions antirabic serum was ineffective, probably, in their opinion, on account of the richness of the tail in nerve endings.

It will be remembered (this *Bulletin*, Vol. 30, p. 581) that CUNNINGHAM, MALONE and CRAIGHEAD from experiments on monkeys showed that the "Paris" strain of fixed virus conferred a more solid immunity than the "Kasauli" strain (isolated from a dog at Kasauli, and in general use in India). SHORTT, MALONE, CRAIGHEAD, and MCGUIRE,¹⁹ now record the results of a large experiment on alternate human cases, contrasting the antigenic values of the two strains. 6,173 persons were treated by the Kasauli strain, and 6,150 by the Paris strain. The authors consider that Class IV cases (*i.e.* (a) deep extensive bites on all parts of the body, or (b) all bites

¹⁷ PROCA (G.), BOBES (S.) & JONNESCO (D.). Sur la sérothérapie préventive de la rage.—*C. R. Soc. Biol.* 1934. Vol. 115 No. 9. pp. 1001-1003.

¹⁸ PROCA (G.), BOBES (S.) & JONNESCO (D.). Inoculation intracaudale du virus rabique et sérothérapie de la rage—*C. R. Soc. Biol.* 1934. Vol. 115. No. 12. pp 1313-1315.

¹⁹ SHORTT (H. E.), MALONE (R. H.), CRAIGHEAD (A. C.) & MCGUIRE (J. P.). An Investigation into the Relative Immunizing Value of the Kasauli and Paris Strains of Rabies Fixed Virus.—*Indian Med. Res. Memoirs. Supplementary Series to Indian J. Med. Res.* 1934. Jan. Memoir No. 28. 78 pp.

and scratches on the head and neck), bring out the contrast most clearly. These may be subdivided according to position of bite as follows :—

	Carbolized 5 per cent Paris sheep vaccine			Carbolized 5 per cent Kasauli sheep vaccine		
	Cases	Deaths	Mortality	Cases	Deaths	Mortality
Leg . . .	556	13	2.34	584	12	2.05
Trunk . . .	11	2	18.18	16	0	—
Arm... . .	267	8	3.00	279	10	3.58
Multiple . . .	171	6	3.51	171	14	8.19
Face . . .	227	20	8.81	191	16	8.38
Multiple face	196	4	2.04	180	20	11.11
Total ...	1,428	53	3.71	1,421	72	5.07

It should be explained that "Multiple Face" denotes persons bitten on more than one of the primary positions one of which is the head, whereas "Multiple" denotes those bitten in more than one position excluding the head. [The difference in the total figures is insignificant, $P = 0.1$, and the only figures which show statistically significant differences are those of the multiple face group. It is difficult to understand why this particular group should be the only one which exhibits a significant difference. Further examination of the figures shows that the number of bites is not the deciding factor. Thus it would appear that the difference, if it be a real one, must depend essentially on multiplicity of position. This conclusion, however, is one which it is difficult to accept. For these and other reasons the claim of the authors that the human inoculation experiments demonstrate that the Paris strain is superior in immunizing properties to the Kasauli strain cannot be considered to be completely proved. However, it is in conformity with the results previously arrived at by CUNNINGHAM, and the general effect of the cumulative evidence is in favour of the conclusion being correct.]

An attempt was also made by experiments on monkeys with the same object. The final figures in an experiment in which the infecting dose was given after immunization are as follows :—

Strain	Died	Survived	Total	Mortality
Kasauli	21	75	96	21.9
Paris	16	75	91	15.7
Controls	36	15	51	70.6

[From these figures it appears that immunization by either strain is better than nothing, but that no significant difference can be detected between the two strains. The probable order of efficiency of the three groups is, as in the experiments of CUNNINGHAM and his co-workers, Paris, Kasauli, Controls, but the experiment has again failed to establish the existence of a clear statistical difference between the results obtained with the two viruses. A further experiment in which

the infecting dose was given before immunization leads to the same order of efficiency though statistical methods again fail to demonstrate significant differences between the immunizing properties of the two strains] The result of this experiment may be summarized as follows:—

Strain	Died	Survived	Total	Mortality
Kasauli	59	29	88	67.1
Paris	56	34	90	62.2
Controls	33	8	41	80.5

[The difference between Paris virus and the controls is significant, but that between Kasauli virus and controls is not. Although each of these sets of observations seems to be inconclusive with regard to the difference between the two strains when taken separately, yet the weight of the evidence appears to be in favour of the view that the Paris strain is somewhat better than the Kasauli strain as an immunizing agent.] The authors finally stress the point that the actual numbers of deaths during successive years, "are considered a much better indication of improving results than the percentage death rate. The latter may easily be artificially lowered by the inclusion in statistics of large numbers of patients not really at risk, whereas the total deaths cannot be obscured in any way." The following table is appended.

Year	Total treated	Total deaths	Percentage death rate
1925	8,632	138	1.60
1926	8,372	149	1.78
1927	8,437	126	1.49
1928	8,574	103	1.20
1929	8,365	135	1.61
1930	9,653	118	1.22
1931	11,147	107	0.96
1932	12,801	73	0.57

"A perusal of the table will make evident the great improvement in the year 1932, corresponding with the introduction of the new line of treatment" (Paris strain of fixed virus). "This fall corresponded so exactly with the introduction of the exclusive use of Paris virus, combined with a dosage which entailed a higher average dose of brain substance per patient, that it seems fair to draw the conclusion that these factors were causally connected." [Although this evidence must be taken into account, it is essentially uncontrolled, and there are many conceivable factors which might bring about a reduction in the total deaths from rabies amongst those treated at the Institute. It has not the statistical value of the alternative case observations or of the animal experiments mentioned above.]

A fourth review, by MCKENDRICK,²⁰ of statistics from Pasteur Institutes on the results of antirabic treatment, undertaken by the

²⁰ MCKENDRICK (A. G.). A Fourth Analytical Review of Report from Pasteur Institutes on the Results of Anti-Rabies Treatment.—*Quart. Bull. Health Organisation League of Nations*. Geneva 1933 Dec Vol. 2. No. 4. pp. 553-599.

Health Section of the League of Nations at the instance of the International Rabies Conference (Paris 1934) has appeared. It deals with data relating to 119,433 persons treated, and relates mainly to the year 1931. The author in drawing his conclusions has in certain cases made use of the combined statistics of all four reviews

It was pointed out in previous reviews that the state of risk of the treated non-European was much higher than that of the treated European. From the massed figures it appears that the mortalities are in the ratio of 6.5 to 1.

No evidence has been formed indicating that any one of the methods of treatment followed is superior as an immunizing agent to any other. For example the massed figures for Europeans bitten by dogs which were certified as rabid (Categories A and B) are as follows:—

	Number treated	Deaths		Mortality
		Observed	Calculated	
<i>Europeans.</i>				
1. Cords	3,997	10	7.6	0.25
2 Dilutions	6,362	11	12.1	0.17
3 Killed phenol	5,554	6	10.5	0.11
4 Live phenol	738	2	1.4	0.27
5. Fermi original	3	0	0.01	0.0
6 Fermi sero-vaccine	28	0	0.05	0.0
7 Heated	7,377	17	14.0	0.23
8 Ether killed	7,034	12	13.3	0.17
9. Mixed	15,774	27	30.0	0.17
10. Yatren	2,271	8	4.3	0.35
11 Boecker	931	2	1.8	0.22
	50,069	95	95.0	0.19

Comparison of the observed rabies with those calculated from the average mortality shows that the differences are only slight—in fact such divergences would be expected to occur in samples of a homogeneous population two times out of five.

A similar result appears in the non-European figures.

The facts regarding lateness of arrival put forth in the following table are interesting:—

		Number treated	Deaths		Mortality
			Observed	Calculated	
<i>Europeans.</i>					
0-4 days late	...	90,813	129	117	0.14
5-7 "	...	28,378	32	37	0.11
8-14 "	...	17,366	16	22	0.09
more than 14 days late		7,256	9	9	0.12
		143,813	186	185	0.13

	Number treated	Deaths		Mortality
		Observed	Calculated	
<i>Non-Europeans.</i>				
0-4 days late	25,528	212	210	0 83
5-7 " "	8,652	57	71	0 66
8-14 " "	5,734	41	47	0 72
more than 14 days late	2,960	43	24	1.45
	42,874	353	352	0 82

Thus in the case of Europeans no evidence of an increase in mortality with lateness of arrival can be detected. On the other hand in the case of non-Europeans there is a significant rise between the 3rd and 4th periods ($P = 0.0009$). The tendency for mortalities to vary with lateness of arrival is a complex phenomenon depending upon a number of factors, and an increase cannot be taken as a simple and direct indication of the value of treatment. The question is discussed in some detail in the review.

From figures relating to 290,337 persons it appears that the liability to post-vaccinal paralysis amongst those treated by "live" vaccines is 4.4 times as great as amongst those treated by "killed" vaccines, and 11 times as great as amongst those treated by "heated" vaccines.

A report on antirabies treatment in the U.S.S.R. follows. This deals with figures relating to the years 1927, 1928, 1929 and 1930, the numbers of persons treated being 74,430, 66,154, 53,518, and 49,399—a total of 243,501. The mortalities during the four years were respectively 0.23, 0.20, 0.15, and 0.11 per cent. In fact the reduction in the number treated has been accompanied by a decline in mortality. These two phenomena are difficult to interpret and an exhaustive statistical analysis has been made of the various factors regarding which data were available. The reduction in the number presenting themselves for treatment, and in particular of those bitten by wolves, might be accounted for by assuming that a reduction had occurred in the chance of being bitten, *e.g.*, by a reduction in the number of rabid animals, or by a redistribution of the human population of those parts of Russia from which the patients were drawn. The reduction in mortality is partly accounted for by a reduction in the proportion of those bitten by wolves, and also by the fact that delay in coming for treatment had been reduced. No other significant changes in the type of case coming for treatment appear to have occurred. In the presence of these profound changes, which appear to be largely if not wholly sociological in origin, it has not been found possible to arrive at any conclusion regarding the efficacies of the various methods of treatment employed.

A summary of the results of antirabic treatment at Tonking (Indo-China) is given by GENEVRAY and DODERO.²¹ The method of treatment is that of Calmette, and the course lasts from 15 to 20 days.

²¹ GENEVRAY (J.) & DODERO (J.) Traitement antirabique au Tonkin et mortalité chez les sujets traités pendant une période de sept années (1er janvier 1926—31 décembre 1932).—*Ann. Inst. Pasteur*, 1934 Mar. Vol. 52. No. 3. pp. 352-360. With 3 graphs.

During the year 1929 the scheme of dosage was modified. Cords dried 0 and 1 day were introduced and the total dosage was increased. As a result the mortality amongst those bitten by animals proved or suspected to be rabid fell from 1.43 (1,684 treated) to 0.78 per cent. (2,177 treated). "The treatment thus modified has no contra-indications, and does not cause serious inconvenience. paralyzes remain practically unknown"

FUNAYAMA²² summarizes the results of treatment at Kioto (Japan) during the eight years 1925 to 1932. During the period 923 persons have been treated by cords dried from 1 to 5 days; of these 4 developed the disease. No paralytic sequelae have been observed.

v Rabies in Animals.

A further report on the results of vaccination of animals in Morocco is submitted by REMLINGER and BAILLY.²³ (For previous reports see this *Bulletin*, Vol. 22, p. 704, Vol. 26, p. 737, Vol. 27, p. 755, Vol. 30, p. 137). Ether vaccine was used as previously, and treatment was either prophylactic, after the bite, or for the maintenance of a previously established immunity. Of 1,624 animals inoculated (148 after being bitten) none contracted rabies.

The advantages of formal vaccine are again set forth by PLANTUREUX.²⁴ (See this *Bulletin*, Vol. 29, p. 195 and earlier reviews). The author emphasizes the importance of prophylactic vaccination of dogs in the control of rabies, and points out that with the use of a vaccine in which formalin (4 to 6 per thousand) is kept in contact with the emulsion for 7-14 days and then decanted off, no paralytic accident has been observed in the case of over 2,000 dogs. He states that "in our previous researches we incubated the vaccine at 37°C. in order to obtain a product which was entirely atoxic. Unfortunately, subjection to this raised temperature reduced the immunizing properties of the vaccine, and so we have had to omit this technique" In order to obviate this difficulty the author suggests that the vaccine be kept in contact with formalin for a longer time at a lower temperature. [As the effect of incubation upon the immunizing properties of vaccines killed by the action of any preservative—be it phenol, or be it formalin—is a point of great practical importance it is suggested that PLANTUREUX should publish the results of his experiments in detail.]

That the cat may transmit rabies is well known. REMLINGER and BAILLY²⁵ draw attention to the fact that in certain countries the number of persons bitten by cats is relatively high. They recommend prophylactic vaccination of cats, and state that contrary to common opinion the cat is easy to handle. No apparatus is necessary to hold it. With patience inoculation is easy.

²² FUNAYAMA (Jun-Itchi). Résultats des vaccinations antirabiques pratiquées, de 1925 à 1932, au laboratoire antirabique de l'Université Impériale de Kioto.—*Ann. Inst. Pasteur*. 1934. Apr. Vol. 52 No. 4. pp. 473-477

²³ REMLINGER (P.) & BAILLY (J.). La vaccination antirabique des animaux au Maroc en 1930.—*Arch. Inst. Pasteur d'Algérie*. 1931. June Vol. 9. No. 2. pp. 333-341. [12 refs.]

²⁴ PLANTUREUX (E.). Avantages de la vaccination antirabique des chiens avant morsure dans la prophylaxie de la rage Contribution à l'étude des accidents paralytiques et des moyens de les éviter.—*Arch. Inst. Pasteur d'Algérie*. 1933. Sept. Vol. 11. No. 3. pp 513-521.

²⁵ REMLINGER (P.) & BAILLY (J.). Vaccination préventive du chat contre la rage.—*Bull. Acad. Méd.*. 1933. Nov. 28. 97th Year 3rd Ser. Vol. 110. No. 38. pp. 577-581.

vi. *Miscellaneous.*

OROPEZA²⁶ describes a case of human rabies in Venezuela, where in spite of the large number of stray dogs, the disease is rarely observed.

Successful efforts to control rabies in the district of Saigon-Cholon are discussed by LEBON.²⁷

The biochemical characteristics of the blood of rabbits during the course of rabies infection are described by ITO.²⁸ The blood cholesterol diminishes slightly from the time of infection, but after some days it increases. There is no increase of sebaceous acids or of lecithin. There is no change in lipase content. A decrease in blood sugar when symptoms manifest themselves is followed by an increase in the later stages. The iodine acid index rises 10 to 30 per cent. but falls during the agony.

The total serum albumen diminishes, whilst globulin and fibrinogen increase. There is no change in water content. The rate of sedimentation of the erythrocytes increases. All these changes point to a destruction of albumen in the system.

FISHL²⁹ compares the results of treatment in Palestine by the Pasteur-Calmette and by the carbolized vaccines (incubated at 37°C).

A pamphlet giving information and instructions regarding rabies and its treatment in India is written by SHORTT.³⁰ Its most striking feature is the evidence it affords regarding the extent to which the treatment has been decentralized. For example in the Madras presidency the number of treatment centres is 115, 33 centres are served by the Shillong Institute, and 44 by the Institute at Bombay. Also a new Pasteur Institute has been opened at Patna which will deal with patients from Bihar and Orissa.

In an article of 29 pages, GONZALEZ³¹ deals with the whole subject of rabies: its history, its manifestations, and its treatment. To this is added a summary of the results of treatment at the institutes at Buenos Ayres and La Plata. The article concludes with a discussion of paralytic accidents, and of methods of prophylaxis.

HAGUENAU, CRUVEILHIER and NICOLAU³² claim that antirabic vaccination (15 days, cords dried from 2 to 5 days), gives favourable results in the treatment of sciaticas, migraine, and certain painful tabetic conditions.

A. G. McKendrick.

²⁶ OROPEZA (Pastor). Un caso de rabia humana.—*Gac. Med. de Caracas* 1933. Oct. 31. Vol. 40. No. 20. pp. 286-287.

²⁷ LEBON. De la lutte contre la rage dans la région de Saigon-Cholon durant les années 1931-1932-1933.—*Bull. Soc. Méd.-Chirurg. Indochine*. 1933. Nov.-Dec. Vol. 11. No. 8. pp. 1040-1047. With 4 figs.

²⁸ ITO. Etude biochimique du sang chez les lapins enragés.—*Oriental J. Dis. Infants*. 1933. Nov. Vol. 14. No. 3. [In Japanese. French summary pp. 67-69.]

²⁹ FISHL (Moshe). The Methods of Anti-Rabies Treatment in Palestine.—*Harefuah*. 1933. Sept.-Oct. Vol. 7. No. 5. [In Hebrew pp. 212-228. English summary pp. 1-2.]

³⁰ SHORTT (H. E.). Rabies and Anti-Rabic Treatment in India. Information and Instructions for Anti-Rabic Treatment—50 pp. 1933. Delhi.

³¹ GONZÁLEZ (Hernán D.). La rabia humana.—*Semana Méd.* 1934. Apr. 26. Vol. 41. No. 17 (2102). pp. 1244-1275.

³² HAGUENAU (J.), CRUVEILHIER (L.) & NICOLAU (S.). Sur l'emploi du virus-vaccin antirabique dans le traitement de certaines algies et de la migraine.—*Bull. et Mém. Soc. Méd. Hôp. de Paris*. 1934. May 21. 50th Year. 3rd Ser. No. 16. pp. 671-680.

AMOEBIASIS AND DYSENTERY.

AMOEBIASIS.

REED (Alfred C.) & JOHNSTONE (Herbert G.) with the Technical Assistance of Jeanette VAN DALSEM ANDERSON. **Amoebiasis among One Thousand Prisoners. Final Report.**—*Amer Jl Trop. Med.* 1934. Mar. Vol. 14. No. 2. pp 181–189. [11 refs.]

This report summarizes the results of a protozoologic survey of 1,000 inmates of San Quentin Prison (California) together with treatment of positive amoebiasis cases and a follow up of treated cases.

Examination of stools was by the wet fixation smear and iron-haematoxylin staining technique. 9.2 per cent. of the 1,000 examined were found infected with *E. histolytica*. These were treated with vioform and carbarsone, and were subjected to a careful follow up of more than 16 months, during which chances for reinfection were minimal. Ninety per cent. remained free of *E. histolytica* during this follow up period. On these observations the authors found a belief that re-infection is more important than relapse and that the chief spread of amoebiasis is by food handlers. *H. M. Hanschell.*

MACKIE (Thomas T.) & NAUSS (Ralph W.). **Familial Infection by *Endamoeba histolytica* in New York City. Preliminary Report.**—*Amer. Jl. Trop. Med.* 1933. Nov. Vol. 13 No. 6. pp. 577–582. [15 refs.]

Report of observations made on a family of six, resident in New York City, four members of which were found infected with *E. histolytica*. The infection was probably acquired by one parent outside the city and transmitted to the children. Such a family infection occurring under good living conditions emphasizes importance of searching for and adequately treating carriers of *E. histolytica*

H. M. H.

HEGNER (Robert). **Transmission of *Endamoeba histolytica* in Drinking Water.**—*Jl. Parasitology.* 1934. Mar Vol. 20. No. 3. p. 199.

The author records observations which appear to support the contention, often disputed, that drinking water may be a habitual source of infection with *E. histolytica*. Many missionaries in a Mission in Chiquimula, Guatemala, had during the past decade suffered from severe attacks of amoebic dysentery; during the year following installation of a pure drinking water supply no cases of dysentery had occurred.

H. M. H.

HEATLY-SPENCER (J.). **Difficult Diagnoses. I.—Minor Manifestations of Amoebiasis with a Note on their Diagnosis by the Differential Blood-Count.**—*Jl. Roy. Army Med. Corps.* 1934. Feb. Vol. 62. No. 2. pp. 81–84.

In what may be called the lesser hepatic cases of amoebiasis there may be utmost difficulty in arriving at correct diagnosis, for often none of the usual signs and few of the symptoms of hepatitis are present. In such cases, the author claims, the Schilling-Torgau differential blood count (modification of the Arneth index) is a powerful aid to diagnosis.

The Schilling index does not pick out amoebiasis and declare it, but it does tell when a pathological condition of the blood secondary to an inflammatory process is, or is not, present. Details of two cases of "hepatitis" are given in illustration of the significance of the Schilling index.

The first case presented all the classical symptoms and signs of severe hepatitis following one year after successful surgical treatment of tropical liver abscess.

Blood counts were :—

	Normal (for com- parison)	Case on admis- sion	After 1 week's treat- ment	After 2 week's treat- ment
Total count ..	.	21,000	20,400	13,000
Differential	Per cent	Per cent	Per cent.	Per cent
Eosinophils	3	nil	2	2
Lymphocytes	23	12	15	22
Myelocytes	nil	nil	nil	nil
Metamyelocytes ...	nil	2	1	1
Band forms	4	30	10	6
Polymorphonuclears ...	63	54	64	64
Large mononuclears and transitionals	6	2	7	4
Mast-cells	1	—	1	1
	100	100	100	100

Before commencement of treatment the count shows, in the acute stage of illness, a marked shift to the left illustrated by the rise of band form granular cells, the fall of lymphocytes, and the low relative total of polymorphonuclears. After two weeks' treatment there has been an almost complete change back to a normal differential count. The lag behind of the total count caused no anxiety in view of the recovery of the differential count.

The next case illustrated is one of those in which diagnosis by physical means was impossible. The patient complained of general unfitness with vague sensations of discomfort in region of liver, increased at times by some jarring movement. Investigation revealed nothing—nor did X-ray. The total leucocyte count was good.

Differential count :—

Eosinophils	6 per cent.	Polymorphonuclears	38 per cent.
Lymphocytes	32 "	Large mononuclears	4 "
Metamyelocytes ...	14 "	Mast cells	1 "
Band forms	4 "		

The significance of this count lay in the 14 per cent. metamyelocytes, precursors of the band forms of granular leucocytes. Here then was a definitely pathological count indicating an inflammatory process. Two weeks after treatment, the patient being well on the way to recovery, the count read :—

Eosinophils	6 per cent.	Band forms	nil
Lymphocytes	41.8 "	Polymorphonuclears	47 per cent.
Metamyelocytes ...	2.8 "	Large mononuclears	2.4 "

Important significance lies in the finding of immature polymorphonuclears either in excessive numbers in band forms, or in the appearance of the definitely pathological earlier forms known as metamyelocytes or myelocytes.

H. M. H.

NGAI (S. K.) & FRAZIER (C. N.). **Cutaneous Amoebiasis. A Review and Report of Three Cases observed in North China.**—*Chinese Med. J.* 1933. Nov.-Dec. Vol. 47. Nos. 11 & 12. pp. 1154-1170. With 6 figs. on 4 plates. [30 refs.]

This paper gives a careful review and discussion of twenty-seven cases of amoebiasis cutis reported since 1891 and in addition a detailed clinical and parasitological and histological report of three cases observed in Peiping.

The authors state that cases of cutaneous amoebiasis in which the organism has been studied and identified as *E. histolytica* are few in number. In general they fall into two clinical groups: those in which the dermatitis is secondary to an amoebic abscess of the abdominal viscera, usually the liver; and those with fistulous or condylomatous ulcers of the perianal region and buttocks. Adequate study has not been made of the source of infection especially in the latter group, but it is assumed to be an antecedent amoebic colitis with or without symptoms of dysentery. In the former group involvement of skin is by direct extension of an abscess or along a surgical incision, in the second group presumably by direct contact with contaminated faeces, or by direct extension from the bowel.

Of the authors' three cases, here described, two showed condylomatous lesions of the genito-anal region, one of which was preceded by an acute bloody diarrhoea. One case, that of a woman, was complicated by early syphilitic disease of the genitalia. In the third case a papilloma of the anal region was invaded secondarily by *E. histolytica*.

The amoebae were studied in fixed tissue preparations (biopsy) in each case, and in the living form in one, and identified as *E. histolytica*. The histological characteristics of the skin lesions were like those produced in other tissues by this parasite. The presence of amoebae between fairly normal epithelial cells in the most superficial lesions and their tendency to spread along the path of least resistance in deeper structures suggest that the amoeba may be able to penetrate tissue by the mechanical action of its pseudopodia.

H. M. H.

CRAWFORD (Stanley). **Amoebiasis Cutis: Report of a Case.**—*Arch. Dermat. & Syph.* 1933. Sept. Vol. 28. No. 3. pp. 363-368. [19 refs.]

The author gives a full report of a case of extensive amoebic ulceration of both buttocks, which began as an amoebic abscess in the perianal region in association with amoebic colitis. After rupture of the abscess the ensuing ulceration of skin (biopsy revealed *E. histolytica* invading the cutis) spread over both buttocks during a period of four years, leaving tough fibrous scars in healed areas, while active areas persisted peripherally in spite of treatment with emetine hydrochloride and excision.

H. M. H.

CHOPRA (R. N.), SEN (S.) & SEN (B.). **Treatment of Chronic Intestinal Amoebiasis with Gavano, a Derivative of Ipecacuanha.**—*Indian Med. Gaz.* 1934. Mar. Vol. 69. No. 3. pp. 130–133.

The authors record the results of treatment by gavano in 18 cases of chronic amoebic dysentery.

The criterion of cure, the only one possible in the circumstances, was six negative examinations after cessation of treatment. Six patients were cured, in 10 the drug failed and in 2 results were indeterminate, the proportion of probable cures to failures in this series being 1 : 1.66

The drug was given by mouth. It is claimed to be a derivative of ipecacuanha, and to be a compound of emetine or cephaeline with an organic acid. In therapeutic doses it causes no vomiting or nausea, has no irritant effect on kidney or liver, and no toxic effect on circulatory and nervous systems, but its amoebicidal properties appeared to be less than those of E. B. I., the kurchi alkaloids, or carbarsone.

Neither kurchi alkaloids nor carbarsone, two of the most effective drugs against chronic amoebiasis, have any effect on liver conditions associated with amoebiasis. It is possible that gavano or an allied compound may prove a less toxic drug than emetine for such conditions.

H. M. H.

ANDERSON (Hamilton H.). **Emetin in Amebiasis.**—*California & Western Med.* 1934. Mar. Vol. 40. No. 3. pp. 198–199

The author protests that since less toxic and more effective amoebicides are available, one should not embarrass an infected individual by using such a potentially dangerous drug as emetine except in those cases exhibiting impaired hepatic function or hepatic abscess.

It has been demonstrated experimentally and clinically that emetine is many times more toxic when given by vein than by mouth, subcutaneously or intramuscularly. Even oral administration results in accumulation of the drug in the body. The subcutaneous route is the method of choice, however, for emetine may cause disturbed gastroenteric function when given by mouth. Abscess may result from its injection into muscle. Excretion of the drug is extremely slow. It is apparently fixed in muscle tissue, particularly cardiac, and on this account toxic range for repeated doses is the same as for a single administration. Pathologic and cardiographic evidence support JAMES's contention that patients who have been given emetine are not good surgical risks because of possible myocardial damage resulting from the drug. Clinically an increase in pulse rate and lowering of blood pressure indicate beginning of cardiac dysfunction. Abnormal cardiographic tracings are obtained only in patients who have severe myocardial involvement.

H. M. H.

CHOPRA (R. N.) & SEN (B.). **Toxic Effects of Emetine on the Cardiovascular System.**—*Indian Med. Gaz.* 1934. May. Vol. 69. No. 5. pp. 262–263. With 1 fig.

The case of a European woman of 48 admitted to the Carmichael Hospital for Tropical Diseases with general irritation of the skin and feeling of weakness and depression. Four years before she was treated

in London for amoebic dysentery receiving a course of emetine-bismuth-iodide by the mouth for 12-14 days, after 6 daily doses the pulse became rapid and the patient extremely weak and she was kept in bed for 7 days. She regained health in about a month and returned to India. In 1933 she had an attack of amoebic dysentery and was put on emetine. After 9 injections (6 on successive days, then on alternate days), she became very weak with frequent pulse, mental depression and itching skin. Three weeks later she came under the authors' care. The pulse was then 90 to 100, of low tension, the blood pressure 106 mm systolic and 70 mm diastolic. No urticaria, no helminths or protozoa in the stools, no malarial parasites. Electro-cardiographic examination (curves and data given) indicated myocardial damage with tachycardia of sinus origin.

The authors point to the toxic effect of emetine on both occasions. Colonel Chopra has seen several cases in which itching of the skin and even urticaria and large pruriginous plaques were produced and persisted for a month after a course of emetine, which damages the capillaries. He published a paper in 1924 on the changes in the hearts of rabbits after emetine administration [see this *Bulletin*, Vol. 21, p. 916] A. G. B.

BACILLARY DYSENTERY.

DE ASSIS (Arlindo). Dysentaria bacillar. A proposito de sua etiopathogenia. [**Bacillary Dysentery.**].—*Brasil-Médico*. 1934. May 5. Vol. 48. No. 18. pp. 308-313. [10 refs.]

In this review of bacillary dysentery, as it occurs in Brazil, there are one or two observations to note with regard to the organisms which have been isolated in epidemic and endemic dysentery. The organisms are:—(1) The bacillus of Shiga (2) the bacilli of the group of Flexner, containing such types as Strong, Y and Hiss, (3) the bacillus of Schmitz closely resembling the Shiga bacillus and mannite-negative but easily distinguishable by its indologenic power and its serological specificity, and (4) the bacillus of Sonne, often called Kruse-Sonne and which should strictly be called the Castellani-Kruse-Sonne bacillus.

Some reference is made to the gravity of clinically acute cases according to the causative type of organisms. These are arranged as follows:—(1) Cases of moderate or severe symptoms with varying prognosis, but usually good, due to bacilli of Shiga and of Flexner-Hiss, (2) well defined cases of moderate or severe symptoms but of short duration and good prognosis, due to the bacillus of Schmitz, and (3) doubtful clinical cases resembling more dysenteriform enteritis of subacute type, of quite good prognosis, due to the Sonne bacillus.

Some observations are made on the "healthy carrier," and the opinion is expressed that such carriers are cases of dysentery of trivial type and perhaps of isolated and trivial lesions. They may, however, progress.

Dysenteries may be divided clinically into two types, the acute, classical, unmistakable dysentery, and the chronic dysentery which may not always be diagnosable as true dysentery and is liable to be confounded with localized disturbances in the intestinal tract.

W. F. Harvey.

CHOPRA (R. N.) & CHAUDHURI (R. N.) **Dysentery produced by *Bacterium pseudo-carolinus***—*Indian Med. Gaz.* 1934. May. Vol. 69. No. 5. pp. 251-254.

Bacteriologists have been familiar now for nearly three decades with a multitude of organisms, all named, and all supposed to have etiological relationships to dysentery. Probably the naming adopted by KRUSE, which gave to each new bacillary form, as it emerged, a new letter of the alphabet, was the simplest and best. After him many an organism has appeared, with an eponymous title, to claim a place upon the dysentery string. Many of these have had to forego their place as new entities because of proofs of identity with one or other of KRUSE's alphabetical series. There is presented in this article a very good case for the causation of a more or less type form of dysentery by *Bacterium pseudo-carolinus*, a type quite capable of being recognized through its syndrome by an acutely observant nursing sister. "The number, colour and consistency of the stools passed was very variable in different cases. The stools were either diarrhoeic or constipated, pasty looking or hard; they had a more or less normal yellow coloration or were clay coloured. There was both blood and mucus in the stools in seven patients only, while the large majority, i.e., 24 cases, had neither blood nor mucus in the stools while in hospital." *Bacterium pseudo-carolinus* is not a lactose fermenter and produces not merely acid but gas in glucose, maltose and mannite. But by far the most interesting and possibly important observation made by the authors is the suggestion that this organism may be no more than a variant of *Bact. flexneri* produced by the action of a phage, "phage-mutated" is the expression used. It would be a great simplification if a number of the present competing non-Shiga, "pseudo-dysentery" species could be reduced to variants, by dissociation or phage action, of a few simple stem forms.

W. F. Harvey.

GUNewardENE (T. H.). **Acute Bacillary Dysentery in Children: Advantages of its Treatment by Petroleum and Allied Preparations.**—*Indian Med. Gaz.* 1934. May. Vol. 69. No. 5. pp. 256-259. With 1 chart.

Much of this article is taken up with the symptomatology, diagnosis, prognosis and treatment of acute dysentery in children. The point of special interest is the treatment adopted. The treatment preferred is by liquid petroleum-nujol in half drachm doses every 2 hours while the child is awake. Hydrolax may be used in older children. No purgatives and no intestinal antiseptics are required. It is suggested that the nujol acts like natural mucus. With this treatment children "show marked improvement sooner than when treated by active purgation." Symptoms such as extreme restlessness due to dehydration, irritation and tenesmus, are greatly diminished or are not manifest at all.

W. F. Harvey.

DE MENDONÇA (F. Carneiro). Ueber die Endemie der Dysenterie in der Irrenanstalt in Rio de Janeiro. [**Endemic Dysentery in the Lunatic Asylum, Rio de Janeiro.**].—*Deut. Med. Woch.* 1934. May 25. Vol. 60. No. 21. pp. 794-795.

Endemic dysentery in the Rio de Janeiro lunatic asylum is bacillary and due especially to organisms of Flexner type. Its continuance has

been traced to carriers and its transmission to flies. The administration of serum by the mouth and measures against flies were followed by disappearance of the endemic.

W. F. Harvey.

- BOYERS (Luther Musson) Human Amebiasis A Review of 700 Cases expressing 1961 Complaints—*California & Western Med* 1933 Dec Vol 39 No. 6 pp 397-401
- DE BUEN (Saul) Sobre un caso de disenteria amebiana—*Medicina Paisos Calidos* Madrid 1934 Apr Vol 7 No 4 pp 145-149. With 8 figs [12 refs]
- FERNAN-NUNEZ (M) Amebiasis its Clinical Aspects and Control—Reprinted from *Wisconsin Med J* 1934 Mar. 5 pp
- FOSTER (John H) Amebiasis in Connecticut—*New England J* of Med. 1934 Feb 8 Vol 210 No 6. pp 294-299 With 4 figs [11 refs]
- GRADWOHL (R B H) Diagnosis of Amebiasis [Correspondence]—*Jl Amer Med Assoc* 1934 Jan 6 Vol 102 No. 1 • pp 65-66 With 1 fig.
- HUARD (P) Aspects chirurgicaux de l'amibiase coecocolique avec neuf observations personnelles—*Marseille-Méd* 1933 Nov 15 Vol 70 No 32. pp 549-585 [7 pages of refs]
- HUARD (P), ROGUES (P) & DEJOU (L) Double abcès du lobe hépatique droit, compliqué d'abcès sousphrénique, d'abcès pulmonaires et de péricardite suppurée, sans perforation diaphragmatique—*Marseille-Méd* 1933 Sept. 15 Vol 70 No 26 pp 293-308 With 3 figs
- IKEDA (Kano) Unusual Experience with Amebic Dysentery in an Average Hospital of a Northern State, with Report of Nine Cases originating in Chicago.—*Jl Amer Med Assoc* 1933 Dec 16 Vol 101. No 25 pp 1944-1953 With 6 figs
- MCCOY (G W) Amoebic Dysentery Problems presented by the Outbreak in 1933—*Public Health Rep* 1934 Feb 2. Vol 49 No 5 pp 141-144.
- REED (Alfred C) Amebiasis—a Clinical Summary—*California & Western Med.* 1934 Jan Vol. 40 No 1 pp 6-10
- STILL (R M Lloyd) & DANG (Manohar Lal) A Case of Resistant Protozoal Dysentery.—*Indian Med Gaz* 1934 Feb Vol 69 No 2 pp 82-83
- SUMERLIN (H S). Amebiasis Incidence in Private Practice—*Jl Amer Med. Assoc* 1934. Feb 3. Vol 102. No. 5 pp 363-364
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KALA AZAR

BOGLIOLO (Luigi) Studi sulle leishmaniosi I Lo stato attuale delle conoscenze sulla trasmissione delle leishmaniosi. [**Present State of Knowledge of the Transmission of the Leishmaniasis.**]—*Ann di Med Nav. e Colon* 1934. Mar-Apr 40th Year. Vol. 1. No 3-4 pp. 139-213. [204 refs.] German summary.

This article which was completed in June 1933 is similar to several others which have appeared during the past few years and reviews in a critical manner all the work which has been done on the transmission of the various forms of leishmania infection

The author, who has not himself worked at the problem, comes to the conclusion, as a result of his perusal of the literature, that the method of spread is still unknown. Though the article contains no new information it is useful as a guide to the now extensive literature dealing with the subject. Over 200 articles are mentioned in the references.
C. M. Wenyon.

FORKNER (Claude E.) & ZIA (Lily S.). *Viable Leishmania donovani in Nasal and Oral Secretions of Patients with Kala-Azar and the Bearing of this Finding on the Transmission of the Disease.*—*Jl. Experim. Med.* 1934. Apr. 1. Vol. 59. No. 4. pp. 491-499

The authors have discovered leishmania in the material obtained by passing an ordinary swab over the nasal mucosa of nine kala azar patients. Parasites were also seen in the material blown from the nose.

In one of the cases they were also found in smears from the tonsil and in the saliva. The tonsil of this patient was found to be heavily infected when sectioned after death. The nasal discharge from two of the cases produced infection in hamsters by intraperitoneal inoculation. The number of parasites in the nasal smears varied. In some they were easily found, in others with difficulty. Two human volunteers and numerous animals have been inoculated into the nasal and oral cavities with nasal discharge containing leishmania, but the results are not yet evident.
C. M. W.

MORALES GONZALEZ (Juan L.). Nota epidemiologica sobre el kala-azar en la provincia de Sevilla. [**K.A. in the Province of Sevilla.**]—*Medicina Países Cálidos*. Madrid. 1934. Jan. Vol. 7. No. 1. pp. 19-25. With 1 map. French summary (4 lines).

Since the discovery of the first case of infantile kala azar in the province of Sevilla in Spain in 1915 about 15 fresh cases have been identified. Of these 5 were noted during the next 14 years and the rest since then. It appears that not only is the disease endemic in the province but it has been on the increase during the past 3 years.

C. M. W.

MENDES (A. B. Cortêa) & FERREIRA (J. Chaves). Kala-azar infantil em Alcacer do Sal [*Infantile K.A. in Alcacer do Sal, Portugal.*]—*Arquivos Inst. Bact. Camara Pestana* 1933. Vol. 7. No 1 pp. 113-129. With 1 map, 4 figs. & 3 charts English summary

During the course of anti-malaria work at Alcacer do Sal in Portugal the authors encountered 11 cases of infantile kala azar amongst attendants at the dispensary during the period October 1932 to January 1933.

The ages varied from 7 months to 8 years, the highest incidence being at 2 years (5 cases). All were diagnosed by spleen puncture and all, except one child who was *in extremis* when first seen, were successfully treated by intramuscular injections of neostibosan (0.05 to 0.20 gm.) given every two days. The total dose varied from 1.25 to 1.90 gm. according to age. In some cases to ensure a cure it was necessary to repeat the course. No further cases of the disease have been seen at the dispensary. C. M. W.

D'OELSCHITZ. Valeur sémiologique des manifestations ganglionnaires et spécialement des adénites épitrochléennes du kala-azar. [*Diagnostic Value of Enlargement of Glands, Especially the Epitrochlear, in K.A.*]—*Bull. Acad. Méd.* 1934. May 8. 98th Year. 3rd Ser. Vol. 111. No. 17. pp. 619-620.

During his 10 years experience of kala azar in children and adults in the south of France the author has come to recognize a general glandular enlargement, in which the epitrochlear glands are especially involved and much more enlarged than other glands, as a sign of kala azar, provided always that syphilis can be excluded. C. M. W.

NATTAN-LARRIER (L.) & GRIMARD-RICHARD (L.). Sur le séro-diagnostic de la leishmaniose viscérale. [*The Serodiagnosis of Visceral Leishmaniasis.*]—*C. R. Soc. Biol.* 1934. Vol. 115. No. 3. pp 266-269

In this paper the authors give some further details of the method of carrying out the serological test which they have described for the diagnosis of leishmania infections (*ante*, p. 230). From their further experience of the test they confirm their original conclusion that it is the diagnostic method of choice when it is not possible to undertake spleen or other puncture for the discovery of parasites.

C. M. W.

CAMINOPETROS (J.). Une séro-floculation spécifique de la leishmaniose interne. Son utilité pour le diagnostic de l'infection et pour le contrôle du traitement. [*A Specific Sero-flocculation in K.A. Its Value in Diagnosis and Treatment.*]—*C. R. Soc. Biol.* 1934. Vol. 115. No. 9. pp. 910-912.

If to 2 cc. of a 1 to 4 per cent. aqueous solution of sulfarsenol is added drop by drop serum of a case of kala azar it will be found that after the addition of the first drop a milky colour is produced. This increases in intensity and becomes a definite flocculation when 7 to 20 drops have been added. The addition of more drops after the maximum flocculation has been reached causes it to diminish and finally disappear.

With sera from healthy individuals or from those with diseases other than kala azar the slight flocculation which may be produced at the first drop has completely disappeared by the third or fifth. If to the solution of sulfarsenol to be used are added 3 or 4 drops of a serum

which is known not to give the flocculation this will prevent the reaction with kala azar sera. The reaction appears very early in kala azar infections and does not disappear till a definite cure has resulted. The author claims that the test is more reliable than the antimony test.

C M W

SANCHIS BAYARRI (V.) & MONTOLIU VOLANT (C.). Nueva tecnica para el diagnostico serologico del kala-azar. [**New Technique for the Serodiagnosis of Kala Azar.**]*—Medicina Paisés Cálidos* Madrid 1934. Jan Vol. 7. No 1. pp 12-18. French summary (6 lines).

In carrying out the antimony test for kala azar the authors advise the use of a 4 per cent solution of urea stibamine in physiological saline and a 1 in 5 and 1 in 10 dilution of the serum, which has previously been heated to 56°C. for half an hour. The precipitate obtained at the point of contact of the solution and serum is a very definite one, the reaction being absolutely specific for kala azar. C. M. W

D'OELSNITZ (M) & RONCHÈSE (A. D). Valeur et sensibilité de la réaction de Chopra pour le diagnostic du kala-azar. [**Value and Sensitivity of Chopra's Reaction for the Diagnosis of K.A.**]*—Bull et Mém. Soc. Méd. Hôpît de Paris.* 1934. Apr. 30. 50th Year. 3rd Ser. No 13. pp. 548-553.

During 3 years the authors have tested the antimony reaction in cases of kala azar in the south of France.

The best results have been obtained by pouring on to the surface of the undiluted serum a 4 per cent. solution of urea stibamine. The precipitate formed with the serum of cases of kala azar is of a tenacious character, not broken up by shaking and sinking finally to the bottom of the tube as a compact mass. If, as sometimes happens, sera from other cases give a slight cloud at the surface of contact this disappears spontaneously in the course of half an hour. With old solutions a more definite precipitate may form but this dissociates rapidly into minute flocculi which sink to the bottom. These false reactions cannot be confused with the genuine one. It has been found that urea stibamine gives a better result than neostibosan, while undilute serum and a solution of the drug not stronger than 5 per cent. gives better reactions than other concentrations. Though fresh solutions should be used if possible, serum nine months old and solutions of the drug kept sterile in ampoules for 18 months are still capable of giving a reliable test. The authors state that the only cause of error is the patient having taken quinine. Compared with the formol-gel test the antimony reaction of CHOPRA is both more rapid and reliable and remains the most satisfactory of completely safe tests for the identification of kala azar.

C. M. W.

KASSIRSKY (I. A.). Die Punktion des Knochenmarkes und die Blutbildung bei der visceralen Kinderleishmaniose. [**Bone Marrow Puncture and Blood Formation in Infantile K.A.**]*—Folia Haematologica.* 1934. Mar. Vol. 51. No. 3/4. pp. 352-358. With 2 figs.

In this paper the author reverts to the subject of puncture of the sternum for the diagnosis of kala azar in children (*ante*, p. 231) which he

claims to be not only a safer and simpler operation than spleen puncture but one which is more accurate in its results. The opportunity was taken of studying the material obtained from the point of view of the changes which occur in the marrow cells in the course of the disease.

It is concluded that there occurs an increased erythrocyte destruction. This is borne out by the slight jaundice, the presence of indirect bilirubin up to 1 in the serum and the increase in the urobilinuria and osmotic resistance of the erythrocytes. In response to this the bone marrow produces more red cells as also do extramedullary centres of blood regeneration which come into operation. The red cell destruction occurs in the spleen, liver and other places where the reticulo-endothelial system is hypertrophied. It is probable that the red cells are also affected to some extent by the action of a toxin from the parasites, as evidenced by their abnormal size and shape. In the peripheral blood the regenerative process produces polychromatophilia and the presence of normoblasts to the number of 2 to 3 to 100 leucocytes. In the white parts of the marrow in early stages of the disease when there are 6,000 to 9,200 leucocytes in the peripheral blood there may be a marked reaction in the direction of premyelocyte production. When, however, the stage of leucopenia supervenes the marrow responds with the myeloid reaction. It is then possible to distinguish degenerative changes in the marrow leucocytes. The eosinophile cells are frequently present in the marrow in greater numbers than in the blood, a feature which the author thinks is indicative of a good prognosis. Of especial interest is the presence in the marrow of large numbers of lymphocytes (25 to 30 per cent.), but it is believed that the majority of these at least are brought to the marrow by the blood, where they may form 80 per cent. of the total leucocytes. On the other hand it cannot be denied that some lymphocyte production may occur in the marrow. Another cell in the material is the monocyte, the origin and development of which can be studied to advantage. It is clear that the investigation of marrow obtained in the way described is capable of throwing considerable light on the processes of blood destruction and regeneration and the cellular response to leishmania and other infections

C. M. W.

INDA (Francisco F.), VÍFOLI (Donato) & VACCAREZZA (Américo J.). Estudio anátomo-clínico de un caso de kala-azar en el adulto (fiebre negra). Primera observación en nuestro país. [K.A. in an Adult, seen in Argentine.]—*Semana Méd.* 1934. Feb. 8. Vol. 41. No. 6 (2091). pp. 413-424. With 5 figs.

The case described is that of a man 34 years of age who emigrated to the Argentine from Yugoslavia in 1929. He commenced to be ill in 1931, a year and a half after taking up his residence in the district of Salta. The disease developed during the next year till in a serious condition he was admitted to hospital on October 26, 1932, and died a few days later. Examination of the organs *post-mortem* revealed a leishmania infection. Though the district of Salta is known to be an endemic centre of cutaneous leishmaniasis the authors incline to the view that the case was one of kala azar contracted in the Mediterranean region by the patient before he left for the Argentine. Clinically and pathologically the case appears to have been a typical one of this disease.

C. M. W.

BENELLI (C.), ZUCCARELLI (J.) & SAUTET (J.). A propos d'un cas Corse de kala-azar de l'adulte à évolution fatale. [**A Fatal Case of K.A. in a Corsican Adult.**].—*Rev. Méd. et Hyg. Trop.* 1933 Sept.-Oct Vol 25. No 5 pp. 261-262.

The case described was in an adult 23 years of age. The disease, contracted in Corsica, had been diagnosed as kala azar two years before this and a course of neostibosan injections given. After the course nothing was heard of the patient till his return to the hospital two years later in a condition of extreme cachexia. The original diagnosis was confirmed by the discovery of parasites by spleen puncture. Death resulted shortly after in spite of treatment. C. M. W.

EAST AFRICAN MEDICAL JOURNAL. 1934. Mar. Vol. 10. No 12 pp. 363-364.—**A Case of Kala Azar from the Elgeyo Reserve.**

The case of kala azar recorded was in a native of the country and is the first autochthonous case to be diagnosed in Kenya by the discovery of leishmania by spleen puncture. In 1927 a case was identified on clinical grounds alone, but the present case recognized by Dr. FORBES proves that the disease exists in Kenya. It is pointed out that the population of the Elgeyo reserve has increased very slowly during the past four years, and that kala azar may be responsible for this. Cases of cutaneous leishmaniasis were recorded in Kenya in 1931 and 1932.

C. M. W.

GIBSON (P. L.) & O'FLYNN (J. A.). **A Case of Kala-Azar.**—*Jl. Roy. Nav. Méd. Serv* 1934. Apr Vol. 20. No. 2. pp 184-185
JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE. 1934. July. Vol. 20. No. 3. p. 266.—**Additional Note to a Case of Kala-Azar. Reported on p. 184 of the April, 1934, Issue of this Journal.**

The case of kala azar described was in a naval rating who contracted the disease in Malta. The Wassermann test, which was negative on March 30 and October 12, 1933 showed on January 19, 1934 full inhibition of haemolysis in the test and also in the control (no antigen) tube. It is suggested that the factor responsible for the formol-gel reaction, which was strongly positive in this case, may have been the cause of the deviation of the complement and may account for the records of positive Wassermann reactions in some cases of kala azar.

C. M. W.

GIRAUD (Paul), MOLLARET & MONGES (F.). Trois cas de splénomégalie chez l'adulte. Guérison par le traitement stibié [**Three Cases of Adult Splenomegaly cured by Antimony Treatment.**].—*Bull et Mém. Soc. Méd. Hôpit. de Paris.* 1934. Apr. 2 50th Year. 3rd Ser. No. 11. pp. 468-473. With 1 chart.

The authors describe 3 cases of splenomegaly seen by them in the south of France. All three appeared clinically to be kala azar and were cured by neostibosan or urea stibamine.

It is noted that in kala azar areas it is justifiable to suspect the disease and to proceed with appropriate treatment even when the final diagnosis by discovery of leishmania has not been made. It is pointed out that spleen puncture was not carried out in the last two of these cases because of a death which had followed this operation a short time

before. In the discussion following the paper DECOURT remarks that he had seen a case of kala azar in Paris in an adult who had made a stay on the Côte d'Azur

C. M. W.

D'OELSITZ. Le kala-azar met-il les sujets atteints en état d'anergie ? [**Does K.A. cause Anergy ?**].—*Bull. et Mém. Soc. Méd. Hôp. de Paris*. 1934. Mar. 19. 50th Year. 3rd Ser. No. 9. pp. 409–410

A child from a tuberculous family in the south of France and giving a positive tuberculin skin test was admitted in June 1932 to a sanatorium situated in a large park away from outside contacts. With 50 other children the child in question remained in good health for 15 months, when it became ill. Finally kala azar was diagnosed and treated successfully with urea stibamine. It is recorded that the tuberculin test became negative with the development of kala azar but was positive again after cure. This appears to indicate that kala azar is able to bring about a condition of anergy which disappears when cure has taken place. The author remarks that the development of kala azar in the isolated situation in this single child shows what obscurity surrounds the method of transmission of this disease.

C. M. W.

NAPIER (L. Everard) & GUPTA (C. R. Das). **Further Clinical Observations on Post-Kala-Azar Dermal Leishmaniasis.**—*Indian Med Gaz.* 1934. Mar. Vol. 69. No 3. pp. 121–130. With 10 figs.

In this paper the authors revert to the subject of post-kala-azar dermal leishmaniasis which has been described by them and by ACTON and NAPIER in previous papers (this *Bulletin*, Vol. 25, p. 70 and Vol. 28, p. 160). The present paper deals with a series of 209 cases seen during the past 3 years and brings to a total of over 500 the cases seen in Calcutta, Assam and Madras.

In the present series all the clinical types previously described, with the exception of the "xanthoma" type, have been represented. Other types have come to light, such as mucous membrane lesions, small ulcerated cutaneous lesions, extensive erythema, peri-onchial induration. It is clear that new types of lesion will be encountered from time to time and no claim is made that the types already seen represent limits of the forms the disease may assume. Further experience seems to show that the depigmented and erythematous lesions are not necessarily, as they were in the earlier reports supposed to be, the first lesions to appear and that they subsequently developed into nodules. There is some suggestion that in certain cases the lesions do not pass through the various stages of development indicated before. The presence of ulcerated lesions on the skin or mucous membrane of some cases does not in any way alter the conception of the disease as essentially a non-ulcerating one nor does it bring the condition into line with either oriental sore or muco-cutaneous leishmaniasis of South America.

C. M. W.

NAPIER (L. Everard) & SMITH (R. O. A.). **Dermal Leishmaniasis in Assam.**—*Indian Jl. Med. Res.* 1934. Jan. Vol. 21. No. 3. pp. 557–561.

Owing to the fact that a careful investigation in Madras had shown that the supposed absence or rarity of cases of post-kala-azar dermal

leishmaniasis was not correct, it was considered advisable to carry out a similarly careful survey in Assam, about which similar claims had been made. A careful inspection of villages and tea gardens where many cases of kala azar had been treated brought to light only a few cases of the skin infection. It seems, therefore, that in Assam, where kala azar has in recent years been present in epidemic form, the incidence of the dermal condition is very much lower than in Bengal and Madras, where there is a much better balance between host and parasite.

C. M. W.

BRAHMACHARI (Phanindranath). Studies in Dermal Leishmanoid.

Part I. Rare Type of Dermal Leishmanoid.—*Jl Trop. Med & Hyg.* 1934. Mar 1. Vol. 37. No. 5 pp. 68–70. With 2 figs.

The paper describes a rare type of dermal leishmanoid in 2 brothers, both of whom had been treated for kala azar some 11 years earlier

In both a year or more after the cure was completed there began to develop the present condition consisting of patches of hyperpigmentation on the lower part of the abdomen, around the nipples and elsewhere and similarly extensive patches of depigmentation scattered about the body. In addition there occur on the body a small number of papules and some localized erythema, but nodule formation in the skin was absent. Leishmania were found in papules in one of the cases, both of which showed a definite eosinophilia, a frequent feature of cases of dermal leishmanoid.

C. M. W.

STRUTHERS (E. B.), CHANG (H. H.), LIN (L. C.) & CH'EN (J. T.).

Antimony in the Treatment of Kala-Azar, and its Toxic Effects.—*Chinese Med. Jl.* 1933. Nov.–Dec. Vol. 47. Nos. 11 & 12. pp. 1421–1432. With 1 plate. [17 refs.]

After a preliminary account of the use of antimony for therapeutic purposes and its application to the treatment of trypanosomiasis and kala azar, the authors pass on to consider their own experiences in the use of antimony in the last-named disease in N. China.

They have used a number of drugs, including sodium antimony tartrate, and the corresponding potassium, ammonium, aniline and lithium salts, sodium antimony thioglycollate, "212", antimosan, stibosan, aminostiburea, urea stibamine, stiburea, novostiburea, neostam and neostibosan. The reactions following the use of one or other of these drugs include fever, cough, vomiting, nausea, headache, lymphadenitis, diarrhoea, pain in abdomen, pain in legs, pneumonia, urticaria, gangrene of gums. The frequency with which these have occurred are shown in a table under the heading of the various drugs. Of these reactions the authors consider the most important as danger signals to be fever, enlarged and tender lymphatic glands, diarrhoea and necrosis of the gums. Of 700 cases treated 303 showed reactions, there being a total of 608 reactions in all. Of the 700 cases, 48 were treated with potassium antimony tartrate, 187 with sodium antimony tartrate, 39 with antimosan, 56 with stibosan, 93 with neostam and 223 with neostibosan. It was found that with a maximum adult single dose of sodium antimony tartrate of 0.08 gm. (antimony content 38.01 per cent.) there occurred almost double the number of reactions given by four times the dose of neostibosan (antimony content 42.0 per cent.).

Similarly with neostam, the average maximum adult dose of which was 0.2 gm, there were many more reactions than with neostibosan, the average maximum dose of which was 0.3 gm C M W.

HU (C H.) **Histopathology of Kala-Azar in Experimentally Infected Hamsters with Special Reference to Plasma Cells, Myeloid Tissue, Reticulo-Endothelial System, and Reticulum Fibers.**—*Chinese Med Jl.* 1933 Nov.-Dec. Vol 47. Nos. 11 & 12. pp 1112-1124 With 26 figs. (2 coloured) on 13 plates. [15 refs]

The authors have found that in addition to the well-known hypertrophy of the reticulo-endothelial system seen in hamsters as a result of kala azar infection, there is also an increase in the plasma cells in the lymphoid organs. They are found chiefly in the spleen pulp and in the medullary cords of the lymph nodes. They occur also in other organs, especially round the blood vessels. Though the reticulo-endothelial hyperplasia usually takes the form of infiltration by heavily parasitized cells, it may manifest itself as nodules, masses of cords of elongated or spindle cells free from parasites. Transition between the two types of hyperplasia can be seen. Another feature noted is the increase of myeloid elements in the spleen as a compensatory reaction to the crowding out of the bone marrow with reticulo-endothelial cells.

C. M. W.

CHUNG (Huei-lan) & CH'IN (K. Y.). **The Histopathology of Kala-Azar in Squirrels.**—*Chinese Med. Jl.* 1933. Nov.-Dec. Vol. 47. Nos. 11 & 12. pp. 1142-1145. With 6 figs. on 3 plates.

It has previously been shown by the authors that the squirrel (*Sciurotomias dividianus*) is susceptible to kala azar. It is now shown that the histopathological changes produced by the infection are similar to those found in hamsters and monkeys and are comparable with those in man.

C. M. W.

DE (M. N.). **A Study on the Parasites of Kala-Azar and their Distribution in the Body.**—*Indian Jl. Med. Res.* 1934. Jan. Vol 21. No. 3. pp. 627-634. With 9 figs. on 4 plates. [20 refs.]

A histological study of the organs of twenty-five cases of kala azar has shown that the leishmania are always parasitic in cells of the reticulo-endothelial system. These parasitized cells are constantly present in the spleen, liver and bone marrow, but only occasionally in other tissues which, when revealing these infected cells, have been the focus of some earlier inflammatory process. The author emphasizes his observation that parasites were never present in the endothelial cells lining the blood vessels.

C. M. W.

NAPIER (L. Everard), SMITH (R. O. A.) & KRISHNAN (K. V.). **The Effect of a Plasmodial Infection in increasing Susceptibility to Leishmania Infection in Monkeys.**—*Indian Jl. Med. Res.* 1934. Jan. Vol. 21. No. 3. pp. 553-555.

With the object of testing the view that kala azar in man is secondary to some other infection, the authors have attempted to lower the natural resistance of *Macaca mulatta* (*Macacus rhesus*) and *Macaca irus* (*Macacus cynomolgus*) to *Leishmania donovani* by previous or subsequent inoculation with a malarial infection. The former monkey,

which possesses some natural resistance to *L. donovani*, was not rendered more susceptible by the plasmodial infection, kept in check by quinine treatment, while the latter, having a lower natural resistance to the kala azar parasite, appeared to be more susceptible as a result of the malaria. C. M. W.

NAPIER (L. Everard) & SHARMA (L. R.). **The Anaemia of the Leishmania-Infected Hamster.**—*Indian Med. Gaz.* 1933 Dec. Vol. 68. No. 12. p. 690

In a previous paper (*ante*, p. 233) the authors described the results they had obtained in a cytological study of kala azar anaemia of man. Though a coloured plate of the reticulocytes of the blood of experimentally infected hamsters was given in the earlier paper, the results of the study of the hamster blood were not mentioned, as it was intended to make a more extensive series of observations in these animals. This, however, has not been possible, so in this note the authors point out that the limited results obtained show that on the whole the anaemia of kala azar in the hamster is similar to, though less marked than, the anaemia in man. Some figures of the cell counts in hamsters are given. C. M. W.

GIORDANO (A.). Le chat dans la transmission de la leishmaniose viscérale de la méditerranée [**The Cat in the Transmission of Mediterranean K.A.**].—*Boll. Sezione Ital., Soc. Internaz. di Microbiologia* Milan. 1933. Dec. Vol. 5. No. 12. pp. 330-332. [12 refs.]

The post-mortem examination for leishmania of 110 adult cats and 10 kittens in Catania, from parts of the town where human kala azar is most common and during the months of June and July when the cases in children are most frequently encountered, has failed to reveal a single infection. Particular care was taken to select only those animals which, from their poor condition and the presence of skin lesions, might have been suspected to be infected. C. M. W.

PREVITERA (A.). La leishmaniose viscérale canine à Catania. [**Canine K.A. in Catania.**].—*Boll. Sezione Ital., Soc. Internaz. di Microbiologia*. Milan. 1933. Dec. Vol. 5. No. 12. pp. 323-330.

PULVIRENTE in 1912 found that a percentage of 1.09 of dogs examined by him in Catania were suffering from kala azar. In the same year PANTO obtained a figure of 2.42 per cent. from 165 dogs, while the author now reports having found 6 cases of infection in 100 dogs examined. He comments on the differences between these figures and passes on to the general question of the much-discussed problem of the relationship between human and canine kala azar in the Mediterranean region. C. M. W.

MONACELLI (M.). Osservazioni e ricerche sul bottone d'Oriente in Italia centrale. [**Oriental Sore in Central Italy.**].—*Riforma Med.* 1934. Feb. 3. Vol. 50. No. 5. pp. 165-170. With 7 figs.

The author reviews the distribution of oriental sore in Italy as described in 137 records and finds that hitherto the disease has been limited almost entirely to the extreme south, in Sicily, Sardinia, Calabria,

Lucania and Apulia. A very few cases have been noted from areas further north as, for instance, Naples one case, Campobasso 2 cases, Ravenna one case. He now records the existence of an endemic area in the middle of the Adriatic coast with Teramo as its centre where he has seen over 160 cases. He discusses the clinical features of some of these cases and the differential diagnosis of the disease. C. M. W.

MONACELLI (M.). Il primo caso di leishmaniosi cutanea autoctona nella provincia di Forlì [**First Case of Dermal Leishmaniasis in the Province of Forlì.**—*Polichinico*. Sez. Prat. 1934. May 28. Vol. 41. No. 21. pp. 813-816. With 2 figs.

The discovery of the first autochthonous case of oriental sore in the province of Forlì in Italy is a further proof of the author's contention that the disease is endemic in the greater part of the Italian peninsula. The case is perhaps remarkable in that the patient was 75 years of age, the sore being a single one on the left cheek and having first made its appearance in December 1932. C. M. W.

MONTAÑES (P.) & NEGRO (E.). Dos casos de boton de oriente en la region Valenciana. [**Two Cases of Oriental Sore from Valencia.**]—*Medicina Paisés Cálidos*. Madrid. 1934. Feb. Vol. 7. No. 2. pp. 82-85. With 2 figs.

One of these cases was in a child 4 years of age and took the form of an ulcerating papilloma of the right cheek, while the other was in a woman 35 years of age, the lesion on the ulnar side of the hand having existed for 21 years. Cases of oriental sore have not hitherto been recorded from the district of Valencia. C. M. W.

BROWNFIELD (O. D.). **A Case of Oriental Sore.**—*Jl. Roy. Nav. Med. Serv.* 1934. Apr. Vol. 20. No. 2. p. 185.

The patient, a naval rating, was admitted to the Naval Hospital, Malta, with a four months' history of a sore at the inner end of the left eyebrow. Typical leishmania were found and healing followed intravenous injection of sodium antimony tartrate. Later in the same year the patient was re-admitted to hospital with a similar ulcer at the centre of the sternum. Both the Wassermann and Kahn tests were negative at the first entry to hospital but were strongly positive at the second. No source of infection could be traced and, if the disease was contracted in Malta, it would seem to be the first case of oriental sore from that island. C. M. W.

CHATTERJEE (Rabindranath). **Notes on the Treatment of Oriental Sore with Berberine Acid Sulphate.**—*Indian Med. Gaz.* 1934. Feb. Vol. 69. No. 2. p. 72.

The paper records the successful treatment with 2 per cent. solution of berberine acid sulphate (May & Baker's "Orisol") of some 2 dozen cases of oriental sore in Marwaris who had come to Calcutta from the Central Provinces. In a single sore 1 cc. of the solution is used by injection through 2 punctures. The process is repeated every other day till 12 treatments have been given. Not more than 2 sores are treated at any one sitting. For a patient with 2 sores it has been found that 12 infiltration sittings are necessary, involving a total of 48 punctures and a total dose of 24 cc. during 24 days. C. M. W.

LOHE (H.). Beitrag zur Therapie der Hautleishmaniose. [**Treatment of Dermal Leishmaniasis.**—*Med. Klin.* 1934. Feb. 2. Vol 30. No. 5. pp. 158-160.

Two cases of oriental sore which proved refractory to treatment with salvarsan or antimony but which responded to injections of berberine sulphate.
C. M. W.

DOSTROWSKY (A.). **The Diagnostic Value of Vaccine for Oriental Sores.**—*Harefuah.* 1933. Sept.-Oct. Vol. 7. No. 5. [In Hebrew pp. 205-211. With 1 fig. English summary p. 1].

Owing to the fact that in 23 per cent. of the cases of oriental sore in Palestine it is not possible to find leishmania because they are few in number or obscured by contamination, an attempt has been made to obtain a diagnosis by a skin test.

A vaccine containing one million flagellates per cc. (in 5 per cent. phenol) was injected intradermally in a dose of 0.1 cc. The result is regarded as positive if a papule not less than 0.5 cm. in diameter develops in 48 hours. A positive result was obtained in 97 per cent. of cases of oriental sore. A positive result was also obtained in 10 per cent. of cases free from oriental sore and in 5 out of 6 cases of leprosy.

Positive results are also obtained in persons who have recovered from oriental sore many years before.
C. M. W.

MISCELLANEOUS.

YORKE (Warrington). Die Probleme der Arzneifastigkeit. [The Problem of Drug Fastness.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934. Feb. Vol. 38. No. 2. pp. 55-66.

A valuable review is given of the work carried out in Liverpool during the past six years on the problems of drug fastness in order to determine (1) whether drugs act directly on parasites or produce some parasitocidal substance from the tissue of the host, (2) whether when a strain of parasite becomes drug fast the primary change occurs in the parasite or in the host; (3) the nature of the change. Pentavalent arsenic and antimony compounds are shown to be much less trypanocidal than trivalent compounds both *in vivo* and *in vitro*, those compounds which are highly trypanocidal *in vivo* acting also in high dilutions *in vitro*. The therapeutic activity of any particular arsenic or antimony compound is thus dependent on chemical constitution rather than on the action of the host's tissue. Germanin, however, though relatively inactive *in vitro*, is highly active *in vivo*. Strains of trypanosomes rendered resistant to a particular aromatic arsenic or antimony compound were found to be resistant also to other aromatic compounds of these metals but not to a number of non-aromatic compounds or to germanin. It is therefore concluded that the state of resistance is developed not against the metallic radical but against the aromatic nucleus. The nature of the change resulting in drug fastness is shown to be due to decreased powers of absorption on the part of those parasites which have become drug fast, this decreased power of absorption being in the nature of a mutation from the original non-resistant strain. The property of drug fastness remains constant even when trypanosomes have been passaged through the tsetse fly. G. M. Findlay.

CHOPRA (R. N.), GUPTA (J. C.) & CHOPRA (G. S.). Pharmacological Action of Kurehicine (an Alkaloid of *Holarrhena antidysenterica*).—*Indian Jl. Med. Res.* 1933. Oct. Vol. 21. No. 2. pp. 277-281.

The authors received from a firm of London chemists a white crystalline powder isolated from *H. antidysenteriae*, labelled *kurchine* hydrochloride. This they found to be very similar in properties to *kurchicine* described by GHOSH and BOSE. The crystals are very soluble in water and are therefore suitable for oral and parenteral administration.

To sum up the results of their study of this substance, *kurchicine* was found to be a general protoplasmic poison like emetine. Intravenous injections in animals produced a well marked fall in blood pressure. With toxic doses there was definite slowing of the heart with complete heart block. The vessels of the splanchnic area were dilated. Respiration was at first slightly stimulated, probably secondary to the fall in blood pressure but with large doses it quickly stopped, the heart continuing to beat. The plain muscle of intestine and uterus was stimulated even in high dilution.

A. G. B.

PALTHE (van Wulfften). **Psychiatry and Neurology in the Tropics.**—*Malayan Med Jl.* 1933. Sept Vol 8 No. 3 pp 133-145.
[Summary appears also in *Bulletin of Hygiene.*]

The psychic adaptability of Europeans in the tropics is very high. In the whole of the Netherlands Indian archipelago with its 250,000 Europeans there is no single sanatorium for "nervous patients" and there are only 652 Europeans who are inmates of lunatic asylums. Of these only a very small percentage have disturbances of which the origin may be traced with any probability directly or indirectly to the influence of the tropics.

In general, the psychoses of the natives do not differ much from those seen in Europe. Dementia paralytica develops even among the inhabitants of the remotest villages when they get infected with syphilis and there is no reason for supposing that the central nervous system of the native is unfavourable ground for the development of this disease. The schizophrenias of natives usually progress more quietly and smoothly than in European patients. True melancholics are seldom, if ever, seen among the natives but frequently among the Chinese. The author has never seen cyclic insanity. Infectious diseases and intoxications repeatedly lead to acute confusional insanity. The luetic psychoses in particular occupy a large and special place both in frequency and symptomatology. The difficulties of the European psychiatrist are great for besides the bar of language there remains a doubt whether there is not a specific oriental mental make-up which is different from that of the Western. After long years of work the European psychiatrist may get an insight into the inner thoughts and feelings of the group of people among whom he lives but certainly not into those of the folk, as a whole, of each tribe, with its own language or dialect, morals, customs and traditions, which inhabits Netherland India.

Amok is a method of reaction to toxic, infectious or emotional influences among natives, regardless of their race. In the author's opinion the character of amok is the standardized form of emotional explosion occurring in a person involved with his neighbours. In a modern hospital, where everything is carried on in European fashion and where an entirely different tone is maintained, amok has ceased. Latah is certainly not a psychosis and those who are afflicted maintain their social position and do their work perfectly well. The symptoms differ in degree but not in kind from the mimicking phenomena which we may observe daily around us and most of it is an artificial product, as was so much of the hysteria seen in Charcot's time. Koro is thought by the author to be an anxiety state in which the patient is in terror that his penis will shoot into his belly and that as a result he will die. After long hours of vigil, during which appropriate measures are taken, the attack gradually wears off but is repeated again and again. It is possible that the anxiety is not only as to death but also bears the character of a castration phobia.

Nothing is known of the actual number of insane persons in Netherland India but it is certain that the accommodation available is wholly inadequate. As a consequence observation hospitals and nursing homes are filled with the old and demented while new patients have to wait months before they can be admitted.

Among neurological patients there is a striking number of acute inflammatory affections of the central and peripheral systems. It is not improbable that a food factor may be found to play a large part in

many of the encephalopathies. Among all the millions of vaccinations performed not a single case of post-vaccinal encephalitis has been diagnosed. Acute poliomyelitis occurs only rarely and sporadically. Syphilis dominates the neurological picture and the number of patients suffering from one or other form of lues of the nervous system is, out of all proportion, high. Happily, reaction to treatment is favourable. One peculiar condition is a stroke in young men who are not suffering from lues, hypertension, arteriosclerosis, kidney or heart disease. Such seizures have a fleeting character. Persons attacked have low blood pressure and the cause may be sought in excessive smoking, overwork, living in warm places and exposure to direct sunlight. This condition with others associated with low blood pressure the author writes of as "essential hypotension" and holds to be of autonomic system origin.

E. D. Macnamara.

JORDAN (Edwin O.) & MCBROOM (Josephine). **Notes on Intestinal Flora in the Tropics.**—*Amer. Jl. Trop. Med.* 1934. Jan. Vol. 14. No 1. pp. 27-32.

These notes call attention to the necessity for a systematic investigation of cases which are labelled "enteritis" and comparison of tropical cases with those of the temperate zone. "Enteritis and diarrhoea are common in Puerto Rico." This contrasts notably with a territory such as the Panama Canal Zone, where typhoid and dysentery have now practically disappeared, water is chlorinated, milk pasteurized, a good sewage disposal system exists and fly breeding is minimal. Various bacilli of the typho-dysentery group were isolated and examined in detail. The relations of these strains were determined and although in some cases the cultural relationships were definite they were not always serologically so definite. In the discussion of their findings the authors remark that probably "in tropical countries such as Puerto Rico . . . systematic bacterial examination would show a considerable number of unrecognized typhoid infections, and also many infections with various types of paratyphoid and dysentery bacilli. . . . In a well-sanitized tropical area, on the other hand, such as the Panama Canal Zone, . . . the bacterial flora of hospitalized adults does not differ noticeably from that of a similar population group in a northern city," such as Chicago.

W. F. Harvey.

RADSMA (W.), STREEF (G. M.) & KLERKS (J. V.) Over het zuurbase evenwicht bij tropenbewoners. Eerste mededeeling: Over de reactie der urine, in't bijzonder der onder "basale" voorwaarden verkregen morgenurine bij tropenbewoners. [**Acid-Base Equilibrium in the Tropics. Reaction of the Urine, especially Morning Urine, in the Tropics.**—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1932. June 7. Vol. 72. No. 12. pp. 798-807. With 5 figs.]
 —, —, & —, Over het zuur-base evenwicht bij tropenbewoners. 2de mededeeling.—*Ibid.* 1933. Oct. 24. Vol. 73. No. 22. pp. 1357-1370.

An elaborate investigation and discussion of the reasons why the urine of native laboratory servants contrasts so strongly in its greater acidity with that of European residents (?) at Batavia.

The authors pay special attention to the morning urine and the 24 hours urine. They have considered such possibilities as the influence of

polyuria, of CO_2 loss, food differences, respiration, sweat secretion, etc. Native students and Chinese students occupied a position intermediate between the Europeans and the native servants, which seems to point to the conditions of living rather than race being the cause of the differences. The summary for the 24 hour investigation reads as follows.—

1 The hydrogen-ion concentration of the urine of native laboratory servants and the titrable acidity per kilogram body weight and per unit of basal metabolism was greater than in European residents 2 The excretion of ammonia per kgm body weight and per unit of basal metabolism was greater, the excretion of fixed bases smaller, in native servants than in Europeans. 3 The phosphate excretion calculated on body weight was lower in native servants than in Europeans as also was the excretion of Cl and SO_4 per unit of basal metabolism 4 These results indicate a deficiency of mineral constituents in the food and especially in fixed bases with a compensatory increased formation of ammonia in the body. 5 The excretion of organic acids in the urine in the native servants was higher per kgm body weight than in Europeans but, reckoned per unit of basal metabolism, was the same as in Europeans

W. F. Harvey

REVIEWS AND NOTICES.

ANIGSTEIN (Ludwik) [M.D., Ph.D., etc.]. **Researches on Tropical Typhus. A Study of the Bacteriology, Serology and Epidemiology of the Disease.**—*Studies from the Institute for Medical Research, Federated Malay States, No. 22.* 1933. pp. vii+184 With 5 charts, 8 plates & 1 map.

Dr Anigstein's work on the cultivation of the virus of typhus exanthematicus is well known. In this important and stimulating study he tells of the isolation of numerous strains of polymorphic organisms from men and rodents infected with tropical typhus, and he describes many experiments in support of his hypothesis that these strains, though they differ from one another in morphology, biological reactions and pathogenicity, all represent stages in the transformation of parasitic *Rickettsia* into saprophytic *Proteus X*.

He was specially seconded from the post of parasitologist at the State Institute of Hygiene in Warsaw for this investigation of the tropical typhus of Malaya, and from June 1929 until the end of 1930 he worked at the Institute for Medical Research in Kuala Lumpur. During that period 237 cases were notified, 170 of these were of the rural, or scrub, type and agglutinated XK, while the remaining 67 belong to the urban, or shop, type and agglutinated X19. There were 19 deaths among the 170 rural cases, but only 1 among the 67 urban cases.

The virus of tropical typhus proved to be much less pathogenic for guinea-pigs than the virus of classical typhus, only 10 per cent reacted with fever, as compared with 92 per cent in classical typhus, and the fever was shorter, lower, and more irregular. Loss of weight was more frequent, and was found in 25 per cent. A haemorrhagic gelatinous exudate about the polar fat of the testis and in the tunica vaginalis occurred in the majority of inoculated animals, but actual redness and swelling of the scrotum was observed in only 6 per cent. Numerous polymorphic gram-negative organisms were found in the exudate over the tunica vaginalis. These organisms were of two forms: (1) slender, spindle-shaped, polymorphic rods, and (2) minute, intracellular, bipolar-staining coccobacilli resembling small *Past pestis*. The author found these organisms indistinguishable from the *Rickettsia orientalis* of tsutsugamushi demonstrated by NAGAYO, and he considers that they are "different phases of the *Rickettsias*—and represent the aetiological agent of the disease." Brain lesions, like those of classical typhus, were found in most of the guinea-pigs which had reacted clinically, but in cases where the scrotal reaction was most pronounced the brain lesions were least conspicuous.

In rats, a febrile reaction followed inoculation of the virus in about 20 per cent., but it was slight and lasted only 3 or 4 days; on the other hand, 12 per cent. showed redness and swelling of the scrotum and *Rickettsiae* were found in the tunica vaginalis. A positive Weil-Felix reaction occurred in 28 per cent. of the rats inoculated with material from human cases of scrub typhus; but, in many cases, it was X19 and not XK which was agglutinated, and here one calls to mind FELIX's warning (1933, *Trans. Roy. Soc. Trop. Med. & Hyg.*, Vol. 27, p. 166) that "the agglutination reactions obtained with *Proteus X* strains and the serum of wild or tame rats ought to be interpreted with utmost caution." A positive Weil-Felix reaction also resulted from the inoculation of infective material into rabbits, but the agglutination was

generally weaker and less regular than in rats. The author examined a number of rats caught in an area where tropical typhus of the rural or scrub form was present, with the result that he found testicular swelling and *Rickettsia* in 4.5 per cent and a positive Weil-Felix reaction in 10.7 per cent (though this was as often with X19 as with XK). In addition he cultivated organisms similar to XK from rats on 9 occasions. On these grounds he regards it as certain that the rat is the reservoir of infection.

The question of the vector remains unsettled; a mite, *Trombicula deliensis*, which B. A. R. GATER regards as a variety of *T. akamushi*, is suspected: but a volunteer, whom the author inoculated with an emulsion of 75 to 100 crushed mites collected in an endemic area remained healthy. Body-lice are not the vectors of tropical typhus; none were found on 472 hospital patients or on 6,459 school children examined in the Malay States. The author found, however, that they could be infected, though less readily than in classical typhus, either by allowing them to feed on patients, or by Weigl's method of rectal inoculation. During the second week of feeding, the lice swelled up and died, and extracellular *Rickettsia*-like organisms were found in the gut. He also succeeded in infecting lice with *Rickettsia* by feeding them upon a patient suffering from the tsutsugamushi disease.

Almost half the book is devoted to the organisms which Dr. Anigstein cultivated from patients, animals and lice during the course of his investigations. He is a firm supporter of the hypothesis enunciated by WEIL and FELIX, in 1921, that the virus of typhus represents the parasitic stage of *Proteus X*, and he states that the *Proteus* strains which he isolated from cases of tropical typhus were transformed into *Rickettsiae* when he inoculated them into lice. But he goes much further than WEIL and FELIX; for he has cultivated a large number of organisms differing from one another in their morphology, growth, fermentation reactions, and pathogenesis, which he regards as stages or steps in the transformation of typhus virus into *Proteus X*. He employed for the isolation of these organisms a medium known as Hottinger broth, which is a pancreatic meat-digest with the addition of ascitic fluid, and he used blood-ascitic agar for the first subcultures. He succeeded in cultivating 76 strains in all. Thirty were from the blood, urine, or brains of human cases of tropical typhus, 2 were from lice, and 44 were from rodents. The cultures were gram-negative and highly pleomorphic, but they tended to fall into three groups; (1) fusiform rods with pointed ends; (2) diphtheroids; (3) minute coccil forms resembling *Rickettsia*. Among the 76 strains, there were 21 *proteus*-like swarming cultures; 18 of these were from passage animals and 3 were from patients' urine. The majority of the cultures had no serological relationship to *Proteus X*, but two strains—one isolated from a patient's urine, and the other from a rat inoculated with a patient's blood—appeared to be definite XK strains; they were agglutinated both by XK immune sera and by the blood of patients suffering from tropical typhus, and they also produced agglutinins for XK in rabbits.

Some of the other cultures, though they had no resemblance to *B. proteus*, and were not agglutinated by *Proteus X* sera, nevertheless produced a positive Weil-Felix reaction when they were inoculated into rabbits; but, as shown in tables 17 and 18, this was sometimes with XK, sometimes with X19, and sometimes with both. Moreover, the titre of agglutination was never above 1 in 250, while the serum of most of the rabbits agglutinated X strains up to 1/25 or even 1/125 before they were inoculated.

Dr. Anigstein found that the three different types of organisms produced different reactions in animals:—(1) the fusiform rods had a low virulence, but gave a positive Weil-Felix reaction in rats; (2) the diphtheroids caused loss of weight, a testicular reaction, and perivascular nodes in the

brains of guineapigs; (3) the minute coccal, or Rickettsial, cultures produced high, sometimes fatal, fever when inoculated into guineapigs, and also a testicular reaction with minute coccal bodies resembling Rickettsia in the exudate. This type of culture was also very virulent for lice, and its inoculation into them resulted in "a most characteristic picture of classical Rickettsias." In support of his hypothesis that these strains occupy a position on the road of transformation from Rickettsia to *Proteus* X, Dr. Anigstein gives the history of two strains which were isolated in 1929. These strains formed isolated colonies on solid media, they fermented no sugars, and they had no serological relation to *Proteus*. They retained these properties for three years, but, in 1932, he transplanted them into broth from two-months' old agar cultures, and, 13 days later, he plated them out onto agar. He now found that they had been transformed into *Proteus* XK, they grew as spreading films, they fermented glucose with the production of gas, and they were agglutinated by an XK serum.

Dr. Anigstein's faith in the integrity of his passage animals is as great as his faith in the trustworthiness of his cultures. He believes that the viruses, of the two forms of tropical typhus, the urban and the rural, are the same, and that "the diverse serological response of the infected organisms to XK and X19 may be interpreted as a result of antigenic transformation of the same virus derived from a common source, but carried probably by different hosts and vectors." In support of this hypothesis he describes the following experiment, in which he began by inoculating XK virus, and finished by finding X19. The blood of a patient who was suffering from an XK infection (rural) was inoculated into Hottinger's broth; 48 hours later this broth was inoculated into a guineapig, the brain of this guineapig was inoculated into a second guineapig, the brain of the second guineapig was inoculated into a rat, testicular washings from the rat were inoculated into a third guineapig, the brain of the third guineapig was inoculated into a human volunteer; this volunteer had a mild fever which lasted for ten days; his serum did not agglutinate XK which corresponded to the virus used at the beginning of this long series of transfers, but it agglutinated the O form of X19 at 1/125 and the H form up to 1/1,000. The author considers that this is cogent evidence of the transformation of XK into X19, but again Felix's warning as to the close association of rats with *Proteus* comes to mind. In connexion with the relation of X19 to XK, it is difficult to understand why Dr. Anigstein's XK immune serum agglutinated his standard OX19 culture more strongly than it agglutinated his standard OXK; and why his X19 serum agglutinated OXK more strongly than OX19, as shown in table XIII. They could not have been pure O strains.

Several other volunteers were inoculated with Dr. Anigstein's cultures, but the results do not appear very conclusive. For example, a volunteer was inoculated with a mixture of 4 cultures of the cocco-bacillary or Rickettsial type; namely 2 cultures from guineapigs inoculated with patient's blood, one from lice fed on a patient, and one from a "rat inoculated with head-lice passage virus." The volunteer had an irregular febrile attack which began 22 days later and lasted for 17 days. A positive Weil-Felix reaction of 1/25 for both XK and X19 appeared 9 days before the temperature began to rise, on the 10th day of the fever, the titres were only 1/50 and 1/125 and they rose no higher. In spite of these low titres, Dr. Anigstein concludes that the cultures representing "the Rickettsial type correspond in their pathogenic action to the original virus." The cultures of the *Proteus* type, such as those isolated from patient's urine, did not produce clinical signs which resembled typhus. A prophylactic vaccine was prepared from formalized cultures isolated from rats caught in an endemic area, and it was used with promising results to begin with, but the reviewer understands that it has since been withdrawn.

The book which is clearly printed, and illustrated with excellent half-tone blocks and microphotographs is the first of its kind to be produced locally in Kuala Lumpur.

William Fletcher.

CALCUTTA. Eleventh Conference of Medical Research Workers held at Calcutta from 27th November to 1st December, 1933.—pp. 11 + 332 1934 Simla Govt. of India Press

Each year a Conference of Medical Research workers is held in India, the problems towards which attention has been directed are discussed, and future programs of research are considered. The eleventh conference was held in Calcutta in November 1933, and its proceedings are reported in the present volume. For ten years Major-General Sir J. D. GRAHAM has been Secretary of the Indian Medical Fund Association, arranging the conferences, and carrying out the multifarious duties connected with the activities of the Association. He now retires leaving behind him a record of fruitful and untiring service both in India and at Geneva.

The report which is now published covers a wide field. It is based upon reports by subcommittees on cholera, malaria, kala azar, plague, rabies and leprosy, and upon a number of notes by various authors relating to these and other enquiries.

That on cholera centres mainly on the enquiries on Bacteriophage, by Dr ASHESHOV and Colonel MORISON. With regard to the latter the subcommittee were of opinion "that on the evidence at present available it is not possible for them to express an opinion on the value of phage in the prevention and treatment of cholera without a more detailed examination of all the facts in regard to the work which has been carried out on the subject during the last six years." They consequently recommended the appointment of an *ad hoc* committee, and the recommendation was adopted by the Conference.

The subcommittee on malaria dealt with the malaria surveys which were being carried out in the Punjab and in Sind, the primary object of those in the latter area being to obtain "a picture of conditions existing prior to the initiation of the Lloyd Barrage." Other enquiries on treatment, transmission, anopheline infectivity and on the influence of various epidemiological factors were discussed. These led to resolutions that, "apart from the heavy direct and indirect mortality caused by malaria, attacks of the disease are largely responsible for labour inefficiency," and that "treatment of the sick constitutes the first step in any antimalarial campaign, irrespective of any other methods employed."

With regard to kala azar, it was decided that, though research on this subject should be continued, the sum allotted for this purpose should be curtailed. Dr. R. O. A. SMITH, the Officer in charge of the enquiry, stated that "some investigators were prepared to accept the fact of the transmission by the sandfly in this manner [experimental transmission to the hamster] as proved, but the proof to others was perhaps not yet quite convincing."

There is nothing very novel in the report of the plague subcommittee. On the one hand enquiries of an epidemiological nature are being carried out in various directions, and on the other further investigations are being made of the biochemical characters of the vaccine, its standardization and its efficacy.

The rabies subcommittee devoted its attention mainly to a discussion of the policy of decentralization of treatment, and to the experiments which had been carried out at the Kasauli Institute, which have already been reviewed in some detail in this *Bulletin*. The subcommittee "viewed with satisfaction the progress made in decentralization of antirabic treatment, and advocated its extension

to those provinces where it has not yet been adopted " Experiments on the use of immune serum as an adjunct to vaccine treatment were adumbrated

Amongst other subjects which were discussed were sandfly fever, tuberculosis, goitre, oriental sore, maternal mortality and problems of general nutrition.

The report concludes with a summary of the evidence given by Major-General Sir J D GRAHAM to the League of Nations' Regional Health Conference at Cape Town (1932) on "India's point of view," with regard to the possible extension of yellow fever to that country, and a note by G M FINDLAY on immunization against that disease.

Much of the work brought before the Conference has already been published, and has been reviewed in the appropriate sections of this *Bulletin*. The remainder will no doubt appear in due course.

A. G. McKendrick.

WU LIEN-TEH & WU (C. Y.) [Edited by]. **Reports National Quarantine Service Series IV—1933.**—pp. iv + 264. With 28 figs. on 18 plates (1 coloured) & 7 charts. 1934 Shanghai, China. National Quarantine Service, 2 Peking Road.

This fourth annual report since the formal inauguration of the Service has, like its predecessors, the object of being a reliable guide to its manifold activities, of being "at the same time a readable and not too technical account of that section of its work which is most closely connected with the commercial world" and of presenting original articles to scientific workers. A country which stretches, as we are told, "from latitude 53° North to 18° North, and therefore possesses every variety of climate from arctic conditions in Manchuria to tropical heat" in the southernmost province, must possess also a great variety of problems for the hygienist.

The original articles in this report deal mainly with cholera and plague, and the first of these is an erudite historical account of "Huo Luan" by the director, Dr Wu Lien-Teh. This ancient Chinese term, if it were not purely applicable to cholera, certainly seems to have included that disease and seems to have been placed on record in the "Nei Ching" and to have been dated therefore B.C. 2697–2597. A very detailed analysis of Huo Luan is given. We may reflect that the syndrome of well-established cholera is a very striking one and that it might easily be recognizable as a disease even at that early period in the world's history. The introduction to the article begins, as do almost all treatises on cholera, with the statement. "It is generally believed that cholera . . . had its original home in the Valley of the Ganges". All countries from Russia in the West to China in the East seem agreed upon this. It might, however, be worth examining further into this statement, after admitting that the cholera vibrio was definitely discovered in Calcutta. We might even take the concluding sentence of this interesting article, with its recognition of cholera in China in remote antiquity, as suggesting the necessity of such a re-examination. "Hence our researches," says the author, "have confirmed in our opinion that Cholera, though rare was not altogether absent from ancient Cathay."

Many facts of importance are recorded in the article entitled, "Rat Flea Survey of Chinese Ports." These relate to the rodent and flea species found and also to their differential distribution in the ports of Shanghai, Amoy, Canton, Tongking and Hankow. "It would appear that *Ceratophyllus anisus* takes the place in China of the more common *Ceratophyllus fasciatus*" and again "*X. cheopis* appears to be able to adapt itself to a wide range of climate, but flourishes especially during the moist warm

summer" The author of this article, Dr C Y Wu, is evidently convinced of the value of rat-proofing as an efficient anti-plague measure and his remarks on the subject are worth quoting "Other factors," he says, "besides presence of infected *cheopis* are necessary for the spread of rat-plague (and later human plague) For instance although there is no reason to suppose that the species and seasonal prevalence of fleas in Amoy and Canton have in any way altered during the past three decades bubonic plague epizootics and epidemics have been extremely rare since the reconstruction of these areas along modern sanitary lines and the increasing use of rat-proof structures for goods storage and human habitation"

The remaining three original articles are worth studying They have the titles, "Cholera and Related Vibrios in Shanghai Waters," "The Cholera Carrier Problem in Shanghai," and "Meteorological Factors in Cholera" A special article by Dr J W Chun deals with "Recent Public Health Activities in Shanghai" It treats of various subjects, among them leprosy, and we may judge of the magnitude of this disease problem, as it confronts China, from the remark made by the author "It has been said that of the three million lepers in the world, China has one million . . . and there are supposed to be about 2,000 lepers in Shanghai" The rest of the volume is taken up with matters which are mainly statistical or of local interest only .W F Harvey

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MALARIA.

CROSS (Bruce) **Some Theoretical and Experimental Observations on Malarial Prevention on Estates.**—*Malayan Med Jl.* 1933 Dec Vol 8 No 4 pp 261-274 [15 refs]

The general situation in the Malay States has not been improved by protracted anti-larval measures, though there have been many isolated successes. It is questionable whether the expense of oiling gives an adequate return. Rubber estates with oiling are compared with those without oiling. An experiment with manure instead of oil is described.

In this interesting paper, which was read at a B.M.A. meeting in Penang, the author states that though it is possible to free a given community from malaria by oiling and other antilarval measures if skilled supervision and sufficient money are available, yet there is as much malaria in the world as there was a generation ago. The main methods adopted on the rubber estates of Malaya have been open drainage and oiling. The medical officer who can only visit an estate periodically must leave the actual work of oiling to the estate manager. The anti-larval measures have been highly successful on some estates, but on others they have been a failure, and it appears that as regards mortality from malaria the agricultural population as a whole is in almost as bad a position as it was a quarter of a century ago, in spite of all the work that has been done. The author is in medical charge of a number of European-owned and Chinese-owned rubber estates, in the latter, "measures for the prevention of disease play a very insignificant part." He gives tables comparing the spleen rates, parasite rates, etc., on several European estates, where oiling is in force, with those on several Chinese estates where there is no oiling. These tables show that there is rather less malaria on the estates which are not oiled, and the author suggests that this may be due to the intensive cultivation and manuring of the ravines on the Chinese estates by market gardeners. On this assumption, he conceived the idea of polluting mosquito breeding-places with manure instead of oiling them. "About half a cart load of manure was put in an empty 64 gallon oil drum and filled up with water." It was then strained and used in the sprayers. The substitution of manure for oil did not result in disaster but in a diminution of malaria. During the year of the experiment there was less malaria throughout the country, and the author claims no more than that "there may be some considerable element of truth in the hypothesis on which the experiment was based."

W. Fletcher.

MALACCA AGRICULTURAL MEDICAL BOARD Report, Statement of Accounts and Senior Medical Officer's Report for 1933 [Hoops (A. L.), Senior Medical Officer].—28 pp. Malacca : Wah Seong Press.

Malaria has decreased steadily for the last 4 years. Antilarval measures were surface drainage and oiling. Treatment was by atebryn and plasmoquine. Cultivation was possibly the principal cause of improvement.

The cultivated area of estates served by the Board comprises 150,782 acres; rather more than half of this area consists of European estates. There are about 20,000 labourers. The senior Medical Officer, Dr A. L. Hoops, found at a recent survey that, out of 11,000 southern Indians working on these estates, only 10 per cent. were poorly nourished, as compared with 60 per cent in Indian villages. He writes "anyone who like myself, has visited Madras villages cannot but draw a comparison favourable to our Malacca estates." The prevalence and severity of malaria have been diminishing for the last 4 years, and the year 1933 was the healthiest on record. The chief lines of mechanical defence have been surface drainage and oiling. The former prevents water-logging and collects the water in defined channels where it can be easily oiled if necessary. "When all is said and done, cultivation is possibly the principal factor in the decrease of malaria. Many estates which were, when newly opened, intensely malarious, have in process of time become so healthy that antimalarial measures are hardly needed." Atebrin, reinforced in subtertian by plasmoquine, has been the standard treatment for malaria. Short courses of quinine, lasting 7 to 10 days, are not to be compared with a 5 day course of atebryn; long courses of quinine are more expensive and yet the relapse rate is higher. About 5 per cent of the patients treated with atebryn suffered from pain in the epigastrium at the end of treatment which was relieved by a purge. In 4 patients who were taking plasmoquine together with atebryn, there was severe colic which lasted for 4 days.

W. F.

MILNE (J. C.). Malaria in Taiping.—*Malayan Med. Jl.* 1933. Dec. Vol. 8. No. 4 pp 290-294. With 6 figs.

The author records a small outbreak of malaria in a town which has been well provided with permanent concrete antimalarial drains. The outbreak was preceded by an unusually long period of dry weather during which the drains were not flushed out, and *A. maculatus* was found breeding just within the mouths of several large circular cement culverts, where a little water had collected owing to partial blockage by weeds, or to unevenness of the surface. The inspection chamber of the drain which had an iron grating over it, was another unusual place in which larvae were found.

W. F.

GATER (B. A. R.). Notes on Malayan Mosquitoes, V. Some Remarks on *Anopheles maculatus* Theobald in Relation to Malaria.—*Malayan Med. Jl.* 1933. Dec. Vol. 8. No. 4. pp. 277-283. With 2 figs. [13 refs.]

Are there different races with different food preferences within the species *A. maculatus*? Is the December rise of malaria due to the efflorescence of latent infection?

(1) Racial differences in the same species of mosquito have been shown to be of importance in the transmission of malaria, notably in the case of *A. maculipennis*. CHRISTOPHERS considers that the heavily scaled *A. willmori* of the Himalayas is really a variety of *A. maculatus*. *A. maculatus* var *dravidicus*, which occurs in the peninsula of India, is more heavily scaled than typical *maculatus*, but less heavily than *willmori*. This form, too, CHRISTOPHERS considers inseparable from typical *maculatus*, but he has noted that it differs from the typical form in not being a haunter of houses or cattle-sheds. This suggested to the author that there might be some relation between the heaviness of the scaling on the abdomen and the susceptibility to infection. Numbers of *A. maculatus* were fed on patients suffering from subtertian malaria. Out of 128 examined, 67 became infected, but the susceptibility to infection did not appear to have any relation to the abdominal scaling.

(2) WATSON's "maculatus wave" in the Malay States occurs between February and July, and is followed by a rise in malaria. A second increase of malaria occurs in December which it is difficult to correlate with the incidence of *A. maculatus*. Colonel S. P. JAMES suggested to the author that this December rise might be similar to the spring malaria of Holland which is due to latent infections acquired months before.

W. F.

ITYENGAR (M. O. T.). **Anophelines found Naturally Infected with Malaria Parasites in Travancore.**—*Records of the Malaria Survey of India*. 1934. Mar. Vol. 4. No. 1. pp. 61–63. With 8 figs. on 2 plates.

The following natural infections of anopheles were found during the routine examination of mosquitoes caught in intensely malarious villages near Kulasekharain in Travancore. *A. jeyporensis*, 3 specimens contained oocysts out of 1,988 dissected between February 1932 and September 1933. (1) *A. varuna*, one oocyst infection was observed out of 59 examined. (2) *A. fluvialis*, 4 oocyst infections and one salivary gland infection were found in 132 examined. (3) *A. culicifacies*, one specimen with salivary gland infection was found among 984 examined.

W. F.

DE MELLO (Froilano). Première campagne antimalarienne active à Goa. [**First Active Anti-Malaria Campaign at Goa.**]—*Arquivos da Escola Méd.-Cirurg. de Nova Goa*. Ser. B. 1934. No. 5. pp. 1025–1211. [In French, with Portuguese official memoranda and reports intercalated.]

The country of Goa consists of two main divisions—Velhas Conquistas in which there is very little malaria, and Novas Conquistas in which there is a great deal. The standard of living, the civilization, means of communication and the like are far more advanced in the Velhas Conquistas, and there is an average of one doctor to every 2.85 kmq., whereas in the Novas Conquistas there is only one to 122.09 kmq. Novas Conquistas is mountainous, and much of it is covered with jungle, communication is difficult, and the people are very poor. Malaria has become a very serious problem there; during the last thirty years, it has spread to villages which were formerly free from it, and in

many districts the population has been decreasing steadily year by year. The splenic index varies from village to village; in some it is low, in others it reaches 100 per cent. The anophelines are *cuhci-facies*, *maculatus*, *sinensis*, *lislom*, *fuliginosus*, *stephensi*, *leucosphryus*, *pulcherrimus*, *ludlowi*, *rossi*, *jamesi*, *vagus*, *barbistrostris*, *cuhciformis*, *karu-ari*, *aikenii*, *theobaldi*.

A Commission was appointed by the Governor, in 1929, to inquire into the situation, and in its report drew special attention to the need for (1) improved means of communication, (2) medical assistance, (3) pure drinking water, (4) drainage and irrigation. As a result of this report, a number of medical units has been established in different parts of the country and free medical treatment has been provided for all labourers and for all others who cannot afford to pay for it. All collections of water within a kilometre of habitations are drained or treated with Paris green. Jungle and undergrowth around villages and on the banks of streams are cleared away. In the very malarious villages, the inhabitants are given a 7 days' mass treatment with quinine and plasmoquine, followed by two doses a week for 3 months. At the same time, collections of water are treated with Paris green and adult mosquitoes are killed in the houses by fumigation. The medical units do not limit their activities to malaria, but deal with all matters connected with preventive medicine, such as water-supplies and the like. The results have been most encouraging. W. F.

MORIN (H. G. S.). Premiers résultats de l'emploi de procédés agronomiques dans la lutte antipalustre en Indochine. Expériences de M. Dupasquier. [Agriculture in the Prevention of Malaria in Indo-China.]—*Bull. Soc. Méd-Chirurg. Indochine*. 1934 Feb. Vol. 12. No. 2. pp. 230-244. With 5 figs. on 2 plates, 2 text figs. & 1 chart.

The growing of shade trees over breeding places gives good results after 2 or 3 years.

M. DUPASQUIER, the director of the experimental agricultural plantations at Phu-ho, had little money for anti-malaria work at his disposal and such work was expensive because the houses and the anopheles breeding places were scattered over a wide area. He screened some of the houses and he oiled some of the breeding places, but the main method of control adopted was the planting of shade trees and plants along the ditches and streams, with a view to preventing the breeding of the sun-loving anophelines of the district.

For a long time no improvement followed, but now, after two or three years, there is a reduction in the amount of malaria. Constant supervision of the shade trees is necessary, and where disease has caused withering and let in the sunlight, it is necessary to oil. Certain leguminous plants are useful for planting in gullies after a preliminary draining by an open earth drain, and they are useful as manure. The following have been found the most suitable: *Crotalaria anagyroides*, *Cassia hirsuta*, and *Cassia alata*. In order to prevent breeding in ditches and canals, a row of shade trees is planted along each bank. The best results have been obtained with the common *Melastoma* which is plentiful in the district. The paper is illustrated with excellent photographs. W. F.

- 1 KHAW (O. K.) & KAN (H. C.) **Some Observations on the Prevalence of Malaria in Nanking and its Vicinity.**—*Chinese Med J* 1934. Feb. Vol. 48. No. 2 pp 109-123 With 2 figs (1 map). pp 109-123 [28 refs]
- 11 YANG (C. S.) & CHIANG (W. L.) **Some Notes on Malaria in Nanking. A Review of 250 Cases.**—*Ibid* pp 124-137. With 6 figs. [20 refs]

i Many refugees have come to Nanking; there is a good deal of malaria, the only anopheles is *A. hyrcanus*.

Discharged soldiers, indigent farmers from the north and refugees from provinces which have suffered from flood and famine have flocked to Nanking where they have sought temporary shelter on the outskirts of the city. Unskilled labour is paid at the rate of 30 cents. a day, and, if a man works every day of the year, he can earn about \$10 in the 12 months. It is therefore not surprising that Nanking is unhealthy. During the spring and summer of 1932, the authors examined 6,976 persons. The total spleen rate was 18 per cent., in children under 12, it was over 30 per cent. The total parasite rate was 13 per cent., it was considerably higher in children than in adults. *P. vivax* constituted 65 per cent. of the infections throughout the year, and 79 per cent in May, *P. falciparum* 27 per cent. throughout the year, and 52 per cent. in August and September, *P. malariae* 8 per cent., this type reached its maximum in late autumn. The only anopheline found was *A. hyrcanus* var *sinensis*.

11. The authors have investigated malaria in 250 cases admitted to the Central Hospital during the last 3 years. The majority of their patients were young soldiers and labourers suffering from subtertian malaria. The case mortality was 13 per cent. in subtertian, and 6 per cent. for the whole group.

W. F.

- RUSSELL (Paul F.) & NONO (Andres M.). **A Mosquito Net for Use in the Philippine Islands. Experimental Studies and Canvass of Materials.**—*Philippine J. Sci* 1934. Feb. Vol. 53 No. 2 pp. 107-140. With 10 plates & 1 fig. [26 refs]

The houses of natives in the Philippines are unsuitable for protection by wire screening. "The first step in malaria prophylaxis to be undertaken by a health officer in the Philippines should be the making of necessary arrangements for the sale of suitable mosquito nets locally." The authors tried a local product known as Sinamay which is made from an indigenous banana (the source of "Manila hemp"), and they found that it impeded the passage of air less than cotton mosquito-netting which was more expensive. Where there is no mattress, or where a bed is not used, the net should have tunnels near the bottom in which bamboo poles or stones can be placed as weights to keep the net in place. If there are holes in the floor-boards under the sleeper these should be covered by a closely woven mat.

W. F.

- EARLE (Walter C.). **Summary of Malaria Activities in Grenada, B.W.I., 1929-1932 Inclusive.** [Report made to the Rockefeller Foundation.]—*Grenada Rep. Med. & San. Dept. Year 1932*. pp. 44-52.

Malaria* is practically confined to the narrow coastal belt of Grenada. *A. tarsimaculatus* is the carrier.

The hills of Grenada, a small island of the Windward group about 100 miles north of Trinidad, rise abruptly from the sea, so that there is no flat coastal plain on the western side and only a narrow belt on the east. Malaria is almost entirely restricted to this narrow strip, it is very uncommon at an elevation of more than 500 feet. There are about 8,000 cases of malaria and 70 deaths from the disease in a population of 80,000, most of whom are coloured. In 1929, a survey was made by Dr. F. ROOT of the Rockefeller Foundation, with the assistance of Dr. L. S. MORGAN, of the Grenada medical department, who has been, since then, in charge of the malaria work in the island. A spleen rate of 12.3 and a parasite rate of 5.1 were found during the survey. Of the infections, 42 per cent were *P. vivax*, 44 per cent. *P. falciparum*, 11 per cent. *P. malariae*, and 3 per cent. mixed. During the period covered by the present report, 90 per cent of the infections were due to *P. falciparum*.

There are three species of Anopheles, *A. tarsimaculatus*, *A. argyritarsis*, and *A. pseudopunctipennis*. *A. tarsimaculatus* has been found wherever there is much malaria, and it is undoubtedly the principal, if not the only, carrier. *A. pseudopunctipennis* does not come into houses to feed on man, it is not easy to infect, and it can probably be disregarded as a carrier. *A. argyritarsis* is easily infected in the laboratory, but it shows no preference for human blood and never attains a high density. It may be a contributing cause of malaria. Numbers of *A. tarsimaculatus* were dissected; the sporozoite rate was 0.5 per cent., and the oöcyst rate was 1.1 per cent. The chief breeding places are: (1) the stagnant pools or lagoons at the mouths of rivers, where the outflow is blocked by a sandbank, (2) mangrove swamps, and wet areas near the coast; (3) old craters of volcanos which have become full of water; (4) ditches in cocoa groves, and in tall grass. *A. tarsimaculatus* can breed in brackish water and in conditions of dense shade. *A. pseudopunctipennis* is most common in water containing algae, and exposed to the sun. *A. argyritarsis* is able to breed under the most varied conditions, but its density is never very high. *A. tarsimaculatus* is the only one with a decided preference for human blood. It shows a marked tendency to rest where it feeds.

One of the areas in which malaria is most severe has been treated with Paris green for the last 2½ years, but "it is a little difficult to definitely appraise the value of the Paris green work." A sum of \$15,000 has been obtained from the Colonial Development Fund for malaria control by drainage of the malarious Sauteurs area. This is mainly a question of maintaining free outlet to the sea from swampy areas, and the canalization of ravines. Lake Antome, an old volcano crater, is responsible for malaria, and impossible to drain; it is suggested that the population might be removed from its immediate neighbourhood.

W. F.

SCHWETZ (J.). Comparaison entre l'infection malarienne des indigènes de la forêt équatoriale et de ceux de la savane. Influence de l'altitude. [*Malaria in the Equatorial Forest compared with Malaria in the Savannah.*—C. R. Soc. Biol. 1934. Vol. 115. No. 11. pp. 1226-1228.]

Malaria in the savannah on the Eastern border of the Belgian Congo, in the neighbourhood of Lake Edward, depended upon the altitude;

below 1,400 metres it resembled that of the equatorial forests in type and intensity, but above 1,500 metres its intensity diminished and beyond 1,800 metres it disappeared W F

TOURNIER (E) Le paludisme à Lomé et au Togo en 1932 et 1933 [**Malaria at Lome and in Togoland.**].—*Bull. Soc. Path. Exot.* 1934 Apr 11. Vol. 27. No. 4. pp. 385-396

Malaria in Lome is subject to great variations from year to year, in dry years there is very little, because the lagoon behind the town is dried up, but when the rainfall is heavy, malaria is severe. The anopheles of Lome are: *A. costalis*, *A. funestus*, *A. pharoensis*, *A. mauritanus*, and *A. nil*; the last two are very rare. The parasitic index of the inhabitants varies from about 50 to 70, 96 per cent. of the infections are due to *P. falciparum*, and 4 per cent. to *P. malariae*. The parasitic index in about 58,000 persons examined in various parts of Togoland was 50 per cent, and almost all the infections were subtertian. The adult native acquires little immunity, and he reacts to infection like a European. W. F.

SHAHIN (Mohamed). Le paludisme en Egypte [**Malaria in Egypt.**].—*Bull. Office Internat. d'Hyg Publique* 1934 Mar. Vol 26. No. 3. pp. 449-455.

The large amount of constructional work on roads and railways carried out during the war, and the thousands of infected soldiers led to an increase of malaria, and, in 1916, the *Commission pour la Lutte contre le Malaria* was appointed.

The Commission has an annual budget which is expended on drainage, antilarval measures, etc. Three malaria centres were set up in important places; but one of them—at Fayoum—has since been closed owing to the amelioration of conditions there. A large amount of quinine is distributed in tablet form; plasmoquine and atebirin are administered under supervision at the malaria centres. Laws have been enacted by which landowners and householders can be required to take steps to prevent mosquito breeding on their premises, and by which malaria can be made a notifiable disease in any locality. W. F.

EL KHALIDI (H. F.). A Résumé of Pre- and Post-War Statistics of **Malaria in Palestine and its Control in Urban Areas.**—*Jl. Egyptian Med. Assoc.* 1933. Aug. Vol. 16. No 8. pp. 843-849.

SHAPIRO (Jos. M.). **Rural Malaria Control in Palestine.**—*Ibid.* pp. 850-857.

i. A good example of the suppression of malaria in a city.

The author is an officer of the Public Health Department. He was born and bred in Jerusalem, and, when he was a boy, he was given a daily ration of quinine at certain seasons because every one in the city had occasional attacks of malaria. He still lives in Jerusalem, but malaria has almost disappeared, and in 1932 there was not a single primary case; his children have never tasted the bitterness of quinine. In 1918, there were 113 deaths from malaria in Jerusalem; in 1931 and 1932 there were none. Formerly, *A. bifurcatus* bred in great numbers in the water cisterns, but these have been rendered mosquito-proof by means of iron covers, and pumps have been provided; other breeding places have been oiled. The result is that *A. bifurcatus* can no longer be found in Jerusalem.

11. Drainage and Paris green are the chief means employed to control rural malaria

There are three main mosquito periods: the first, which occurs in spring and early summer, is the result of local breeding; the second, which occurs in the autumn, is partly due to an invasion by mosquitoes which fly to the villages from comparatively distant swamps as much as 7 kilometres away, apparently in order to seek shelter for hibernation, the third period is in the winter, when the rural mosquitoes remain quiet, though they sometimes feed when the weather is mild and they occasionally cause malaria. The principal carrier is *A. elutus*, other carriers are *A. sergenti*, *A. superpictus*, *A. multicolor* and *A. pharoensis*. As regards antilarval drainage work, the size of swamps has been reduced by cutting canals; both subsoil and open drains have been used. In places difficult to drain, pumps have been employed. The remaining breeding places are treated with larvicides from the beginning of the breeding season. Vegetation is cleared in order to make the application of larvicides easier. "The larvicide par excellence used in rural Palestine is Paris green." Oil is useful in early spring. *Gambusia* have multiplied freely, but have not been found "entirely reliable as larvicides."

W F

HAKKI (Ismail) Les moustiques de Turquie. Etudes épidémiologique et prophylactique du paludisme.—*Rev. Méd. et Hyg. Trop.* 1934. Jan.-Feb. Vol. 26 No. 1. pp 25-34.

HUSAMETTIN. Malaria Control in Turkey.—*Quart. Bull. Health Organisation, League of Nations.* Geneva 1934. Mar. Vol. 3 No 1 pp. 129-152 With 1 map.

The percentage of enlarged spleens in the autumn of 1932 was 19.5. The index in children under 10 was 25.3. The percentage with parasites in the blood was 14.4, in children under 10 it was 15.6. The spring epidemics are due to *P. vivax* in almost all areas, the autumn examinations always show a higher proportion of *P. falciparum* than the spring tests—according to the locality and the season, sometimes one form of parasite predominates and sometimes the other—quartan is widely distributed, but scanty. The carriers are *A. maculatus*, *A. elutus*, and *A. superpictus*. Other anopheles found in the country are *A. bifurcatus*, *A. algeriensis*, *A. nigripes* and *A. hyrcanus*.

"One of the first aims of the Government of the Republic was therefore to create an organization which would be able to supply medicaments to even the remotest villages. Law No 839, of May 13th, 1926, laid down the technical and administrative bases of the campaign against malaria." Under this law an antimalaria service has been created, and the country has been divided into eleven areas, each under the direction of a qualified malariologist. The eleven areas are divided into 64 sectors directed by medical officers, and into 255 sub-sectors in charge of health agents. The ministry of health distributes free quinine to the poor. Public and private undertakings, and farmers, are obliged to supply their servants with quinine. All stagnant water which may serve as a breeding place must be removed; the local inhabitants are obliged to carry out small drainage works themselves, extensive schemes, such as the drainage of large marshes, are carried out by government. When an owner omits to drain off stagnant water likely to form a breeding ground for anopheles, the work is done by the State at the owner's expense. Where drainage is impracticable, larvivorous fish are introduced or larvicides are used. The doors and

windows of all factories, schools and public buildings are required, by law, to be screened. Subsequent to the introduction of these measures, and the distribution of quinine for curative and prophylactic purposes, there has been an improvement in the health of the people and a reduction in the size of their spleens W. F.

SAUTET (Jacques) Paludisme d'hiver en Corse, ses rapports avec le peuplement anophélien homodyname [**Winter Malaria in Corsica.**].—*Riv di Malarologia*. 1934. Vol. 13 No. 1 pp 97–103

The winter is mild on the coastal plain of Corsica where malaria occurs, and the mean temperature is about 10°C (50°F). *A. maculipennis* goes into shelter, but not into complete hibernation, it can easily be aroused and it will feed and even lay its eggs. Its winter quarters are not inhabited houses, because these are far too smoky, but abandoned sheds, ruins and the like.

A few cases of subtertian malaria occur in Corsica during the winter. Batches of cases do not occur in the same house, but they are widely scattered and without relation to one another. The author attributes these cases to infections contracted by individuals who are bitten when they disturb the anopheles in their uninhabited shelters. The attacks occur after the usual incubation period, there is no long period of latency as in the malaria (benign tertian) of Holland. [See also p. 465, above] W. F.

NEZITCH (Eugen) La malaria en Dalmatie.—*Bull. Office Internat. d'Hyg. Publique*. 1934. Mar. Vol. 26 No. 3 pp 463–473

RANKOV (M.) La malaria dans la Serbie du Sud [**Malaria in Dalmatia and in South Serbia.**].—*Ibid.* pp. 474–489. With 4 figs

i. Very little money has been available for antilarval work, but considerable improvement has been effected, chiefly by quinine and, in Dalmatia, by *Gambusia*.

Dalmatia is the most malarious part of Yugoslavia, though the coast is comparatively healthy. The people are miserably poor and live in a very primitive condition; in 1921, 25 per cent. of them were found to be infected with malaria. There is an Institute for the study of malaria at Trogir, with antimalaria stations in all the principal malarious districts. All three forms are present, but subtertian is the most common. There is very little malaria during the winter, though it is possible that some transmission occurs; it begins to increase in the spring, when the people have very little to eat and are exhausted by work in the fields. This rise is due to the efflorescence of latent infections, and begins before mosquitoes have appeared; it reaches its maximum at the end of July. There is a second rise in October which follows the autumn rains. Quartan is more common in the winter, benign tertian in the spring, and subtertian in the autumn. The anopheles are: *maculipennis*, *elutus*, *algeriensis*, *superpictus*, *sinensis* and *bifurcatus*. *A. maculipennis*, the most important carrier, is ubiquitous. Men and money for anti-malaria work are very scarce, but great success has been achieved in some districts by the use of quinine, *Gambusia* and oiling. Apart from the reduction in the number of cases there has been a change in the type, and the proportion of subtertian infections is less than before.

ii. Southern Serbia consists of mountainous districts and wide valleys. *A. superpictus*, which breeds in running water, is the vector

in the mountainous parts, and *A. maculipennis* is the vector in the plains. As in Dalmatia, there is a spring rise of malaria, chiefly due to relapses and latent infections, which is benign tertian in type; fresh infections appear in June, both benign and subtertian, and the curve reaches its peak in August. There are not many quartan cases, they are most common in October. In children under 5 years of age about 55 per cent of the infections are due to *P. falciparum* and 45 per cent. to *P. vivax*, but above 5 years the proportion of *P. vivax* infections falls rapidly, and between the ages of 5 and 10 it is only 20 per cent. When anti-malaria work was begun in 1921, there was neither a laboratory nor a trained staff; the colonists in the areas devastated by the war were decimated by malaria, trains were held up because the drivers were too ill to drive them. Since then, the state public health service has undertaken a campaign against malaria, under the direction of the Institute of Hygiene at Skoplje, with 50 sub-centres. Though means are limited, the attempt has been successful, at Skoplje, for example, malaria has been reduced in 5 years by 41 per cent. Quinine has been the main weapon, its advantages are that it gives immediate results and does not call for so large a capital outlay as permanent antilarval measures. Another important step has been the provision of free meals for poor children. Antilarval works have been carried out so far as funds permitted.

W F

ESCALAR (G.). L'esperimento di Ardea. [Zooprophylaxis in Ardea.] —*Riv di Malarologia*. 1934. Vol. 13. No. 2. pp 217-227. English summary.

The earlier results of this experiment in zooprophylaxis (a belt of pigsties round the village) were given in a former paper (this *Bulletin*, Vol 30, p. 866). In the first months of 1933, seven pigsties were added to the existing 20 in order to complete the protective belt. The results were even better than before; from August to December no case of malaria was observed and the Governor of Rome removed the village nurse because she was no longer necessary. In the surrounding unprotected villages, many cases of malaria occurred.

W F.

LUTRARIO (A.). La prophylaxie du paludisme par la quinine. [Quinine Prophylaxis.]—*Bull. Office Internat. d'Hyg. Publique* 1934. Mar. Vol. 26. No. 3. pp. 456-462.

Powdered bark was imported into Rome in 1642 (some years after the cure of the Countess of Chinchon by the Jesuit, Father Bartholmee Tafur) and Cardinal De Lugo, also a Jesuit, superintended its distribution. The natives of Peru called it Kin-Kin, and in a letter written by Brother Paolo Puccerni, pharmacist of the Collegio Romano, dated 1659, it is referred to as China-China. In 1748 Linnaeus named it Cinchona in honour of the Countess. The reliance which Italy places on this sovereign remedy, both for treatment and prophylaxis, is manifested in her quinine laws. As a prophylactic it is given daily in doses of 0.4 to 0.6 grams, or in doses of 1 gram on two consecutive days every week. Before the quinine laws came into force, the deaths from malaria amounted to more than 20,000 a year; in 1888, 546 per million of the inhabitants died from it. With the quinine laws, there was a progressive diminution down to 2,045 deaths in a year, or 57 per million. The shortage of both quinine and labour during the war caused a serious set-back, but this has now been remedied. The benefits of prophylaxis

were even more striking where better supervision could be exercised, as in the case of troops, railway servants and the like. The Italian school does not subscribe to the view held in many countries, to the effect that prophylactic quinine does no more than render the disease latent, on the contrary, it teaches that the drug frequently destroys the infection by assisting the defensive mechanism of the body in developing an immunity. W F.

CIUCA (M.), BALLIF (L.) & CHELARESCU-VIERU (M.). Contrôle de l'immunité paludéenne acquise à la suite d'inoculations répétées de sang virulent. Essais d'infection provoquée par piqûres d'anophèles infectés expérimentalement. [Immunity due to Repeated Inoculation of Virulent Blood.]—*Bull. Soc. Path. Exot.* 1934. Apr. 11. Vol. 27. No. 4. pp. 330-333.

Mosquitoes infected with benign tertian malaria gave positive results in 70 per cent. of cases, when employed for the therapeutic inoculation of paralytic patients at Socola (Rumania). The injection of virulent blood gave positive results in only 50 per cent. No difference in virulence was found between a strain of benign tertian which had undergone 102 direct passages by blood inoculation from man to man, before mosquitoes were infected with it, and a second strain which had never been passed direct. Patients who had been rendered immune to benign or subtertian malaria by the repeated inoculation of virulent blood were also immune to the same strain if it was inoculated by mosquito bites. IV F.

CIUCA (M.), BALLIF (L.) & CHELARESCU-VIERU (M.). Immunity in Malaria.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934. May 9. Vol. 27. No. 6. pp. 619-622.

At Socola, Rumania, 1,198 patients were inoculated with a routine benign tertian strain; only 50 per cent. showed fever; 16 per cent. became temporary carriers, and 34 per cent. were immune. The immunity was increased by further inoculations; after 3 of them, it rose to 86.7 per cent. After 4 inoculations, it rose to 100 per cent. and withstood the transfusion of 200 cc. of virulent blood and the bites of 25 mosquitoes infected with the same strain. In quartan malaria, the process of immunization was slower; 35 per cent. resisted the first inoculation and 81 per cent. resisted the sixth. In subtertian, immunization took place still more slowly; 39 per cent. were immune to the first inoculation, 75 per cent. immune to the fourth, and 97 per cent. immune to the fifth. A latent infection after only one inoculation does not generally guarantee immunity. Acquired immunity in malaria is sometimes due to latent infection (premunity), but in some cases of immunity the authors were unable to find any evidence of this. W. F.

JONCHÈRE. Quelques conceptions actuelles sur l'épidémiologie et le traitement du paludisme. [The Epidemiology and Treatment of Malaria.]—*Ann. de Méd. et de Pharm. Colon.* 1934. Jan.-Feb.-Mar. Vol. 32. No. 1. pp. 46-69.

The author attended the course of instruction at the School of Malariology connected with the Paris Faculty of Medicine, and took part in the tour of instruction organized by the League of Nations in Yugoslavia. This paper is an account of what he saw and heard.

The principal antimalarial measures adopted in Macedonia are: free treatment for the sick; inspection of schools and treatment of

infected children, distribution of *Gambusia*, dusting with Paris green of such breeding places as cannot be destroyed. These measures are in force from the middle of April until the end of October every year and have effected a great improvement. *A. maculipennis* breeds in the valleys and is responsible for the propagation of *P. vivax* in the early part of the season, *A. superpictus* breeds in the mountain streams and is responsible for the autumn outbreaks of *P. falciparum* infection.

The author discusses CELLI's three types of malaria in Europe: (a) the North European type with a characteristic outbreak of benign tertian in the spring, which KORTEWEG has shown to be due to infections acquired in the previous autumn, the transmitter being *A. maculipennis*, var. *atroparvus*, (b) the North Italian type, in which benign tertian reaches its maximum in August and September, while sub-tertian and a few quartan cases occur in the autumn. The carrier is *A. maculipennis* var. *elutus*, (c) the South Italian type. Here, benign tertian increases from January to March, chiefly from recurrences; there is a second and greater increase in June and July due to fresh infections. Subtertian is the predominant form in this zone, it reaches its maximum in July and August, declines slowly in the autumn, and then almost disappears in winter and spring. The carriers are *A. maculipennis* vars. *labranchiae* and *elutus*.

A useful table of the different varieties of *A. maculipennis* is given, following MISSIROLI and HACKETT —(1) var. *messeae*. An inoffensive race which prefers the blood of animals and ceases both egg-laying and feeding in the winter. Common in the north of Italy, and breeds in quiet fresh water. The eggs have long floats, and are either entirely grey or irregularly pigmented. The larvae have branched hairs on the second abdominal segment. (2) var. *maculipennis*. This is also a relatively inoffensive race. It is most widely distributed, and, like *messeae*, breeds in sweet water. The eggs have long floats with two dark transverse bands on a grey ground. The larval hair is palmate. (3) var. *atroparvus*. This variety is responsible for benign tertian malaria in the north of Europe. It breeds in brackish water, especially in the polders of Holland and in the peaty waters of bonified areas in north Italy. Though it ceases to lay eggs in the winter, it does not cease to feed. The eggs of this race have short floats and are coloured brown, with darker patches. The larval hair is palmate. The numbers of this mosquito can be reduced by comparatively slight modification of their breeding places. (4) var. *labranchiae*. This variety breeds in salt water on the shores of central and southern Italy, and in Sicily and Sardinia, but it can adapt itself to the fresh water of rivers. It lives in close association with man, and is one of the chief vectors of malaria in southern Europe. The egg floats are short, and the eggs themselves are dapple grey. The larval hair is palmate. (5) var. *elutus*. This variety and the last are the principal vectors of malaria in south Europe. In Italy and the rest of Europe, it breeds in brackish water; in Palestine it breeds in fresh water. The eggs of *elutus* are uniformly grey. Floats are absent or rudimentary. (See also this Bulletin, Vol. 30, pp. 825, 832.)

W F

BOYD (Mark F.) & STRATMAN-THOMAS (Warren K.). **Studies on Benign Tertian Malaria. 5. On the Susceptibility of Caucasians.**—*Amer. J. Hyg.* 1934, Mar. Vol. 19. No. 2 pp. 541-544.

The authors have shown that many negroes are refractory to inoculation (*ante*, p. 419) but they have found that "adult individuals of the

Caucasian race are quite uniformly susceptible. Failure to become infected after exposure is due to deficiencies in the parasite or to pre-munition." They exposed 103 white patients to mosquito infection, 16 failed to become infected. Twelve of the 16 were exposed a second time, with the result that they were all successfully infected. *W F*

HELPERN (Milton) **Malaria among Drug Addicts in New York City. An Epidemic of Aestivo-Autumnal and Quartan Malaria among Drug Addicts in New York City transmitted by the Use of Contaminated Hypodermic Syringes.**—*Public Health Rep.* 1934 Mar. 30. Vol 49. No 13 pp 421-423

Main-line shooters and malaria

Eighteen deaths from malaria—17 subtertian and 1 quartan—occurred among drug addicts in New York, during 4 months at the end of 1933. The men were all in the habit of injecting heroin intravenously—so-called "main-line shooters." A few had been in the tropics, but most of them had never left New York. An investigation carried out with the assistance of detectives belonging to the narcotic squad and the homicide squad of the police department revealed that almost all the deceased addicts had frequented the same lodging houses, where the "spike," or hypodermic syringe, was shared by several men at a sitting. A subsequent examination of 150 addicts in a New York prison showed that 9 had parasites in their blood. More infected addicts were found in other parts of the City, among them were 5 quartan cases, an unusual infection in this part of the world. (See FAGET, above, p. 164) *W F*

WAYL (P.). Paludisme congénital. [**Congenital Malaria.**]—*Jl. Egyptian Med. Assoc.* 1934. Jan. Vol. 17. No. 1 pp 10-15. English summary.

The new-born child of a woman with chronic malaria and an enormous spleen became restless on the 3rd day, on the 4th day it had fever and, on the 6th, subtertian rings were found in its blood. In a second case, where the mother had suffered from malaria in infancy, the baby had fever on the 3rd day and subtertian parasites were found in its blood. *W. F.*

MARTIN (René), CHASSIGNEUX & ROUËSSÉ Un cas de paludisme autochtone au voisinage de Maison-Blanche. [**Malaria contracted near a Paris Asylum.**]—*Bull. Acad. Méd.* 1934 May 15. 98th Year. 3rd. Ser. Vol. 111. No. 18. pp. 647-649.

Malaria contracted in the neighbourhood of a hospital where malaria therapy was employed.

A young woman who frequently went for evening walks with her husband in the vicinity of the asylum of Maison-Blanche, at Gagny (Seine-et-Oise), became infected with benign tertian malaria. Her husband had a similar attack, but he was not admitted to hospital, and his blood was not examined. The young woman had never left France, and for several years she had not been outside the valley of Paris. The author had no doubt that she and her husband had been infected from cases of therapeutic malaria under treatment in the asylum. The Académie decided to send to the Committee of the malaria-therapy

centres a resolution proposed by Professor MARCHOUX to the effect that the inoculation and treatment of therapeutic malaria should be entrusted to specialists in malariology, and should be carried out only in urban institutions. (See this *Bulletin*, Vol 30, pp. 826-7)

W. F.

GREIG (E. D. W.). **Case of Post-Malarial Anaemia with Marked Reticulocytosis.**—*Jl. Trop. Med. & Hyg.* 1934 May 15 Vol. 37. No. 10. pp 150-152.

The patient, aged 56, had lived in tropical Africa for 36 years. At the beginning of treatment, the red cell count was 1,560,000, haemoglobin 36 per cent, reticulocytes 35.9 per cent., normoblasts 0.8 per cent.; white cells 15,000. The temperature was 100.4°F. but no parasites were found. He was given two courses of quinoplasmoquine and kept in bed for a month. He was also treated with liver extract, Blaud's pills and arsenic. The reticulocytes rose to 60 per cent with the quinoplasmoquine treatment, but declined when iron and arsenic were given. At the end of 4 months, the red cells had risen to 4,000,000 and the haemoglobin to 60 per cent, the reticulocytes had fallen to 15 per cent.

W. F.

MICKANIEWSKI & HAI. **La forme purpurique du paludisme pernicieux. Son traitement.** [**Purpuric Malaria.**].—*Bull. Soc. Méd.-Chirurg Indochine.* 1934. Jan. Vol 12. No. 1. pp. 66-78.

The authors have seen five cases of purpura in Indochina in three young men, a woman, and a girl of fifteen. All the patients were suffering from chronic subtertian malaria of several years standing. They were all anaemic, with blood counts between two and three millions, and they all had enlarged spleens. They were treated with injections of saline, hypertonic serum, antivenine, plasmoquine, etc., and they all recovered. None of them had taken quinine, and the authors state that it should not be employed in these cases. The symptoms were very much the same in each of the five patients. The first case was seen in 1926; the attack began with the appearance of petechiae and ecchymoses which were followed, in a couple of days, by haemorrhage from the nose, bladder and rectum.

W. F.

EMILE-WEIL (P.). **Trois cas de splénomégalias en apparence primitives chez des paludéens latents.** [**Three Cases of Apparently Primary Enlargement of the Spleen in Latent Malaria.**].—*Bull. et Mém. Soc. Méd. Hôpiti. de Paris.* 1934. Apr. 23. 50th Year. 3rd Ser. No. 12. pp. 539-546.

Three patients, apparently suffering from primary enlargement of the spleen, had their spleens removed and, in each case, the operation was followed by an attack of malaria with parasites in the blood.

The first patient came from Corsica; he gave no history of malaria and no parasites could be found in his blood; but, 12 days after his spleen was removed, he had an attack and parasites were demonstrated.

The second patient was an Algerian who had lived in France for 13 years. Here also there were neither parasites nor history of malaria, but splenectomy was followed by an attack.

The third patient was a Greek who was born in Smyrna, but had lived in France for 16 years. Here, again, there were neither parasites nor history of malaria, but, about a month after his spleen had been removed, he had a typical attack with parasites in the blood. *W. F.*

NATALI (Claudio). Histologische Untersuchungen ueber Nebennierenveränderungen bei einem Fall von Malaria tropica und vergleichende Untersuchungen an Nebennieren experimentell infizierter Affen (*Plasmodium knowlesi*). [**Histological Study of Changes in Suprarenals in Case of Malignant Tertian Malaria and in Monkeys experimentally infected with *P. knowlesi*.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934. Juné. Vol 38. No 6 pp 243-249. With 2 figs. [18 refs]

A histological study of the suprarenals of an English sailor who contracted malignant tertian malaria in West Africa and died in Hamburg, and of 9 monkeys experimentally infected with *P. knowlesi*.

From his histological investigations the author reaches the following conclusions:—That in acute malaria constant alterations of a definite anatomical type are found in the suprarenals which account for the severe symptoms, and the rapid and fatal course. The changes have no relation to the number of parasites. They are a haemorrhagic necrotic inflammation involving both medulla and cortex, the exudation being composed of lymphocytes, histiocytes and plasma cells. The cells of the cortex show peculiar degenerative changes, which although not specific, occurred in all the suprarenals examined, and are characterized by the appearance of roundish or longish basophil granules. The action of the malaria toxin is primarily responsible for the causation of the various histological changes observed in the suprarenals. *E. D. W. Greig.*

SEE-LU (Hung). Beitrag zur Phagozytose von *Plasmodium immaculatum* im peripheren Blut. [**Phagocytosis of *P. immaculatum* in the Peripheral Blood.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934 June. Vol. 38. No. 6. pp. 249-253. With 3 figs.

Observations on phagocytosis of the malarial parasite in 3 fatal cases and 1 other case of malignant tertian infection.

The author notes that so far as he can ascertain phagocytosis of the malaria parasite by lymphocytes has not been previously recorded. From his investigations he concludes that the polymorphonuclear leucocytes play the chief part in the phagocytosis of the parasite, in the second place the monocytes, whilst the lymphocytes take a smaller part. The number of parasites in the polymorphonuclears was one or two, rarely three. The leucocytes are apparently unable to destroy the pigment which remains as a residue. He considers that the phagocytosis by the polymorphs occurs only just before death.

E. D. W. Greig.

SINTON (J. A.). **The Standardization of Mixed Preparations of the Cinchona Alkaloids in Relation to Indian Conditions.**—*Records of the Malaria Survey of India.* 1934. Mar. Vol. 4. No. 1. pp. 5-13.

The author considers that standardization is less necessary in India than in Europe.

"A standardization of the mixed alkaloidal preparations of cinchona bark is to be encouraged. Such preparations seem eminently suitable for mass-treatment among malarious populations who cannot afford more expensive drugs and who cannot easily obtain medical advice." The production of a permanent cure of one infection, in tropical countries where fresh infections with several strains are frequently taking place, seems useless and even inadvisable, but the investigations of MULLIGAN and SINTON (see above, p 462, and Vol 30, p 831) into monkey malaria suggest that if a patient can be tided over the acute primary attack and the earlier relapses by means of treatment, the infection will become latent and he will become tolerant of it, in the same way, if assisted by treatment of the acute attacks, he will become tolerant of other local strains. Such drugs as cinchona febrifuge and totaquina, which are cheaper than quinine, are suitable for the purpose of such treatment. These drugs are, at present, prepared from the residual alkaloids left after most of the quinine has been extracted from the quinine-rich bark of *C. ledgeriana*, together with some added quinine. The quantity of these residual alkaloids is limited, and an increased demand for them will send up the price. When the Madras Commission of 1866 reported that certain of the other alkaloids of cinchona bark were as good as quinine for the treatment of malaria, the price of these alkaloids immediately rose to be equal to, or even greater than that of quinine. A supply of alkaloids for the manufacture of totaquina could be provided by cultivating the hardy *C. succirubra* and *C. robusta*, which could be grown in most malarious countries in the tropics, but such new plantations would not yield bark for years to come, and there are many questions to be considered before a large extension of planting is undertaken. For example, some new synthetic drug might be discovered, as useful as totaquina and at a lower price, again, a fall in the price of quinine might make the new plantations commercially unsound. The author doubts whether it is necessary, in India, to use the standardized totaquina, in place of the less expensive cinchona febrifuge. In India, all the febrifuge is manufactured in government factories and it is not subject to the same variations as it is in countries where it is obtained from many different sources. Standardization increases the cost of production. The cost of production of cinchona febrifuge, totaquina, and quinine sulphate in India are in the proportions of about 1, 2, and 3, respectively. More benefit to the population might result from a wider use of the cheaper febrifuge than from a more limited use of the standardized totaquina. The author concludes that standardization is a question of much more urgent import under European conditions than in a country like India, which manufactures its own product.

W. F.

INDIAN MEDICAL GAZETTE. 1934. Apr. Vol. 69. No. 4. pp. 215-217.—The Total Cinchona Alkaloids.

The following occurs in this Editorial. "The only useful function totaquine (Type II) appears to perform is to provide the quinine manufacturer with a means of disposing of his residue . . . we think it is a pity that the name 'totaquina' should have to bear the stigmata that it will acquire if the quinine manufacturers are allowed to place this poor-quality antimalarial on the market under this name." But tests carried out in Kuala Lumpur and elsewhere have shown that when totaquina (type II) is given in ordinary doses, there is little, if any, difference between it and quinine. Moreover it is the only type of

totaquina available in any quantity, and will probably remain so until cinchona trees have been grown for the production of type I (See this *Bulletin*, Vol 30, p. 76). W. F.

DECOURT (P). Première note sur l'action comparée de la quinine et de divers corps synthétiques sur les gamètes du *Plasmodium falciparum* [The Action of Quinine and Various Synthetic Drugs upon Crescents.]—*Bull Soc Path Exot.* 1934 Mar. 14. Vol. 27 No. 3 pp. 243-246.

Quinacrine destroys M.T. schizonts and has also some action on crescents. Rhodoquine destroys the crescents

Quinine treatment, by intramuscular or subcutaneous injection, was given to 68 patients suffering from subtertian malaria, with the result that though the rings disappeared the crescents persisted in 67.

Quinacrine (866 R.P.), like quinine, was active against the schizonts but did not cause the crescents to disappear; unlike quinine, it was not entirely without action on the latter, for it produced a reduction in their numbers and a degeneration of their substance. A preliminary course of quinine appeared to sensitize the crescents to the action of quinacrine which was then able to bring about their speedy degeneration, and, within 3 or 4 days, their complete disappearance. The doses given were 0.3 or 0.4 grams daily, for 5 to 8 days.

The quinoline derivative 710F., or rhodoquine, may cause toxic symptoms if it is given in doses of 0.04 or 0.06 grams, but, if a preliminary course of quinine or quinacrine is given to destroy the schizonts, a three-days' course of 0.03 grams of rhodoquine daily will be sufficient to destroy the crescents. In a group of 24 cases treated by the author, none showed toxic symptoms. (See above, pp. 432-3.) W. F.

BARROWMAN (Barclay). Tebetren in the Treatment of Malaria.—*Malayan Med. J.* 1933 Dec. Vol. 8. No. 4. pp 257-260

The author obtained excellent results with tebetren in the treatment of 50 cases—27 B.T.; 21 M.T.; 2 quartan.

Tebetren is prepared "for the Proprietors, Chemopharm Limited, by Howard and Sons Limited, London. It is said to be a compound of acridine and quinine derivatives with a derivative of cholic acid and to contain 83 per cent of salts of quinine alkaloids." (See this *Bulletin*, Vol. 30, p. 201). The patients were given 3 tablets, each weighing 3 grains, three times a day for six days. The author concludes that its curative effect is rather less rapid than quinine, but more rapid than atebren, and that the number of permanent cures after 6 days' treatment is greater than that which follows a three months' course of quinine. He also concludes that "tebetren is parasitocidal to both sexual and asexual forms of all types of malaria parasites."

The daily dose given was 27 grains, 83 per cent. or 23.4 grains of which consisted of quinine salts. It is stated in a footnote that, "in one later case there has been no apparent effect on crescents which are still persisting 22 days after treatment." W. F.

MISSIROLI (A.) & MOSNA (E.). Sulle proprietà terapeutiche di un prodotto derivato dalla chinina: C.77-Giemsä. [Giemsä "C 77", a Derivative of Quinine.]—*Riv. di Malariologia.* 1934. Vol. 13. No. 2 pp. 148-160. With 2 figs. English summary (9 lines).

"The authors have experimented on 31 cases of malignant tertian malaria the value of a new drug "C 77" that has been obtained by Giemsä

from the condensation of hydrocuprein with a diazotized chloride. The drug C 77 has not shown any secondary effects on the nervous system, such as those arising from quinine (trembling, buzzing, etc.). This new drug administered in smaller doses than those of quinine has shown an equal efficacy on the attack of fever, on the disappearance of malarial parasites from the peripheral blood and in preventing relapses." W F

MÜHLENS (P) **Modern Methods of the Treatment and Prophylaxis of Malaria by Medicaments.**—*Chinese Med. J.* 1933. Nov.-Dec. Vol. 47. Nos. 11 & 12 pp. 1401-1410.

The author gives details of the therapeutic and prophylactic treatment prescribed in the Hamburg Institute for Tropical Diseases

Plasmoquine was made synthetically by SCHULEMANN, SCHONHOFER and WINGLER in 1925, at the Elberfeld Laboratories which are under the direction of HOERLEIN. It was tested on birds by ROEHL, on general paralytics infected with *P. vivax* by SIOLI, and on cases of malaria by the author and his colleagues in the Tropical Institute at Hamburg. Atebrin was synthesized by MIETZSCH and MAUSS at Elberfeld in 1930. It was tested by KIKUTH on birds, and on human malaria by SIOLI, PETER, the author and others

The following therapeutic treatment for malaria is recommended — *Benign Tertian and Quartan.*—(a) Atebrin 0.1 gram, three times a day for 7 days, or, (b) Quinoplasmoquine 1 tablet, three times a day for 21 days

Subtertian.—(a) Atebrin 0.1 gram, three times a day for 7 days. Then atebrin 0.1 gram together with plasmoquine 0.01 gram, three times a day for a further 3 days—making 10 days' treatment in all. An alternative treatment is quinoplasmoquine 1 tablet, three times a day for 21 days. Relapses in all forms of malaria with this treatment at the Hamburg Institute were less than 10 per cent. In all comatose cases, and in those with a large number of parasites, it is advisable to begin immediate treatment with injections of quinine, or quinoplasmoquine [injections of atebrin are not mentioned].

The following prophylactic treatment is recommended:—(1) one tablet of quinoplasmoquine, or two tablets of plasmoquine compound, daily while in a malarious zone and for four weeks after leaving it. Or, (2) Quinine hydrochloride grains 3 and grains 6 on alternate days while exposed to infection, and for four weeks afterwards.

A tablet of plasmoquine compound contains 0.125 grams (2 grains) of quinine and 0.01 grams of plasmoquine. A tablet of quinoplasmoquine contains 0.3 grams ($4\frac{1}{2}$ grains) of quinine and 0.01 grams of plasmoquine. There are no exact observations on the question of atebrin prophylaxis, but as it is excreted in the urine for 3 or 4 weeks after the last dose it probably has a long protective action [see SOESILO below].

W. F.

MORISHITA (Kaoru), MIYAHARA (Hatsuo) & ISHIOKA (Hiozo). **On the Specific Effect of Various Drugs on the Parasitic Types of Malaria based on the Occurrence of Parasitic Relapses.**—*Kitasato Arch Experim. Med.* 1934. Jan. Vol. 11. No. 1. pp. 10-35.

Plasmoquine, especially in association with quinine, is the best drug for the treatment of benign tertian malaria.

The author has treated comparative series of patients with quinine, with plasmoquine, with plasmoquine and quinine, and with atebrin,

respectively. The patients were kept under observation for 8 weeks ; if no relapse occurred during that period the case was taken as cured. In chronic benign tertian, 60 per cent. relapsed after quinine treatment, 50 per cent. after atebryn, 21 per cent. after plasmoquine, and 13 per cent. after plasmoquine plus quinine. [The numbers are very small ; for example 11 per cent stands for 1 out of 11, 50 per cent for 3 out of 6 and so on.] Fewer relapses occurred in early cases treated with quinine. In quartan, 10 per cent relapsed after quinine, 12 per cent. after plasmoquine and none after atebryn (only 4 cases treated). In subtertian, the relapse rate was 24 per cent. after quinine and 14 per cent. after atebryn. [It appears that some cases of inoculation malaria were included in these series.] W. F.

HOOPS (A L.). A Review of Published Results obtained with Atebryn in the Treatment of Malaria in Malaya. Including a Record of One Year's Treatment of Malaria with Atebryn on the European owned Estates served by the Malacca Agricultural Medical Board.—*Malayan Med Jl.* 1933. Dec. Vol. 8. No 4. pp. 219-235. [28 refs.]

"Atebryn is the best drug available for the treatment of all types of malaria in Malaya."

The author also concludes from the results of treating 594 persons on European owned rubber estates that "Atebryn is infinitely superior to quinine in the prevention of relapses, judging by present records it may be expected to effect a radical cure in nearly 90 per cent. of benign tertian, and in 95 per cent. of subtertian cases." He uses for injection a solution made by dissolving two 0.1 gram tablets in 5 cc. of normal saline ; this is not followed by pain or unpleasant effects [Dr. Hoops mentions that quinine bihydrochloride is now in more general use in Malaya than quinine sulphate which is about \$3 a pound cheaper. This seems a waste of money.] W. F.

GREEN (Richard). Toxic Effects associated with the Use of Atebryn.—*Malayan Med. Jl.* 1934. Mar. Vol. 9. No. 1 pp. 22-30. [13 refs.]

Toxic symptoms are rare, when the usual doses are not exceeded. Certain precautions with regard to treatment are suggested.

Six hundred individuals were treated with atebryn on estates. The total quantity given was 15 tablets for men, 12 for women and a lesser quantity for children. Thirteen hospital patients were given 2 tablets daily for 7 days. None of these 613 persons suffered from toxic symptoms.

One hundred and seventeen hospital patients were given 3 tablets a day for 7 days, or 21 tablets in all, and among them the following symptoms were found either during the treatment or the subsequent period of observation : (a) Abdominal pains, 6 cases (2 severe, 4 mild) ; (b) yellowness of the skin, 1 case (slight) ; (c) headache 4 cases (1 severe, 3 slight) ; (d) cerebral excitation, 2 cases. These last two subjects sang and danced, as though they were under the influence of alcohol, in one instance, the attack came on at the end of the course, and in the other a few days later ; recovery took place after a few hours. Twenty hospital patients were given larger doses—4 tablets daily for 7 days. One of these 20 had severe abdominal pain and 6 had yellowness of the skin.

The author recommends that atebtrin should be given 2 or 3 hours after a meal, and that it should be preceded by a dose of some mild saline. The patient should be encouraged to drink, and "glucose, if thought desirable, could be given as early in treatment as possible." There seems to be a connexion between toxic symptoms and the late appearance of atebtrin in the urine. It usually appears on the third day, if none is present on the morning of the fourth day, treatment should be stopped. The yellow colour of atebtrin can be demonstrated in urine by adding a few drops of acetic acid, heating, and looking down the test-tube against a black background. During treatment and for about 7 days afterwards, toxic drugs such as chenopodium should not be given. The addition of plasmoquine increases the risk of toxic symptoms. Touching the prophylactic effect of plasmoquine in a community, the author thinks that "it will be admitted that suitable conditions for the effective carrying out of such prophylaxis are not commonly met with, or, if created, are difficult to maintain."

In the discussion which followed, Dr. W. T. QUARFEE stated that he had suffered from severe persistent headache while taking atebtrin, and that 4 out of 165 patients treated by him had also suffered from headache. Dr. A. L. HOOPS said that he had seen severe persistent colic caused by plasmoquine and atebtrin when given together; he now gave plasmoquine after the atebtrin course was completed. In his experience, some 5 per cent. of those treated with atebtrin suffered from colic on the fifth day of treatment, but it disappeared after a purge. Dr. B. BARROWMAN stated that colic was most frequent and severe in Europeans and other meat-eaters. It is evident that atebtrin is very widely used on the rubber estates and in the hospitals of the Malay States.

W. F.

SOESILO (R.). Een proefneming met atebtrin "te velde" (3e mededeeling). [Test of Atebtrin in the Field.]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1934. Mar. 27. Vol. 74. No. 7. pp. 394-411. English summary.

Small doses of atebtrin, three times a week, reduced the parasite index of children to zero in an endemic area.

A group of 74 children who were constantly exposed to infection in a highly endemic area were given small doses of atebtrin 3 times a week, for 13 weeks. Forty-two children who were more than 3 years old had a parasite index of 55, but, after 3 weeks' treatment, all parasites had disappeared. The children under 3 numbered 32, and their parasite index was 81 at the beginning of the experiment; but it declined steadily, and no parasites could be found later than the twelfth week. In a control group of 68 children, the index was 73.5 at the beginning and 60.7 at the end of the experiment. There were no toxic symptoms.

W. F.

MAYER (Martin). Fortschritte der Malaria-Behandlung mit den synthetischen Heilmitteln Atebtrin und Plasmochin. [Progress of Malarial Therapy with the Synthetic Drugs Atebtrin and Plasmoquine.]—Reprinted from *Fortschritte d. Therapie*. 1934. Vol. 10. No. 1. pp. 25-30. [22 refs.]

A summary of experiences with atebtrin and plasmoquine in the treatment of the different varieties of malaria.

The author first deals with atebtrin and records the experiences of various workers on the subject. He then discusses the combined therapy with atebtrin and plasmoquine, plasmoquine and chinoplasmoquine, and finally the prophylaxis of malaria with atebtrin and plasmoquine. There is nothing essentially new and the facts concerning the drugs are now pretty well known, but for those who wish a concise summary of the literature of the subject this paper will be found useful.

E. D. W. Greig

SAPEIKA (Norman). **The Action of Atebrin on the Uterus.**—*Quarterly Jl Pharm. & Pharmacol.* 1934. Jan-Mar. Vol. 7. No. 1. pp 41-43 With 2 figs.

The results of these experiments were as follows :—

"Atebrin stimulates the uteri of guinea-pig, rabbit and cat in weak concentration and inhibits the isolated strips in strong concentration. The uterus of the rat is inhibited. The action is apparently directly on the muscle.

"In antimalarial therapy, atebtrin is probably safe for women, as evidenced from experimental results and clinical trials." A. G. B.

MASSIAS (Charles). **Paludisme à *Plasmodium vivax* et à *Plasmodium praecox*.** (Expérimentation thérapeutique, 574 et quiniostovarsol. [574 and Quiniostovarsol Treatment.])—*Jl Physiol. et Path Gén.* 1933 Dec. Vol. 31. No. 4. pp. 1061-1086. With 42 charts.

The author prefers 574 to 710 because it is less toxic, and because it is more stable in a tropical climate. Cachets kept for 8 months have not deteriorated. Only two patients out of 43 vomited, and the drug was taken with impunity during pregnancy. Association with quiniostovarsol decreased the toxicity. No albuminuria, jaundice, or haemoglobinuria occurred in the cases treated.

The dose for adults is 0.04 grams of 574 plus 0.5 grams of quiniostovarsol twice a day after food for 7 days, followed by a second course, if necessary, after a week's interval. A drink of Vichy water or sodium bicarbonate is given after each dose. The author has not seen any cases in which the parasites resisted 7 days' treatment, in either benign or subtertian infections, and the drug appears to act like plasmoquine upon the crescents (See above, p. 430.) W. F.

SERGEANT (André) & VOGT (P.). **De l'action de deux produits synthétiques, la rhodoquine et la quinaquine, sur le *Plasmodium praecox* aux différents stades de son évolution.** [Action of Rhodoquine (F. 915) and Quinaquine (R. P. 866) on *P. falciparum*.] *C. R. Soc. Biol.* 1934. Vol. 115. No. 10. pp. 1101-1102.

— & —. **Expérimentation du "915 Fourneau" ou rhodoquine U contre la tierce maligne à *Plasmodium praecox* d'Algérie.**—*Arch. Inst. Pasteur d'Algérie.* 1934. Mar. Vol. 12. No. 1. pp. 13-21.

F. 915 acts on all forms of *P. falciparum*, including crescents. R.P. 866 resembles atebtrin.

Rhodoquine (Fourneau 915) resembles plasmoquine, but differs from it in being potent not only to destroy the gametocytes but also the trophozoites of subtertian malaria. In 33 cases treated with 0.6

gram daily, both rings and crescents disappeared in two or three days.

Quinacrine (R. P. 866) is the dichlorate of chloro-2-diethylamino-pentylamino-5-methoxy-7 acridine. Its action upon the parasites of subtertian malaria resembles that of atebirin. Twenty-one patients were given 0.3 gram daily, in three doses, for 5 days, with the result that both fever and asexual parasites disappeared, but the crescents were unaffected. [The name Rhodoquine is now reserved for F 710. (See above, pp. 432-3)].

W F

- i. TAREEV (E.), EPSTEIN (E.), PIKUL (I.), GONTAEVA (A) & RASKIN (A.). Résultats des essais cliniques avec les produits Soviétiques synthétiques antipaludéens de série de quinoléine [**Treatment of Malaria with Quinoline Products.**—*Med Parasit & Parasitic Dis* Moscow. 1933. Vol 2 Nos. 4-5 pp. 189-210. [In Russian. French summary p. 210.]
- ii. LEISERMAN (L.). Sur le traitement du paludisme avec le dérivé de quinoléine No 14. Note préliminaire—*Ibid.* pp. 210-214. [In Russian. French summary p 214.]
- iii. MILOSLAVSKI (M.). Les nouvelles préparations quinoléiques dans le traitement du paludisme et les limites de leur efficacité—*Ibid* pp. 215-219. [In Russian. French summary p. 219]

These three papers describe the results of the treatment of malaria with compounds belonging to the quinoline group synthesized and manufactured in Soviet Russia. The most satisfactory results were obtained with "plasmocide" which is a methylene-bis-salicylate of 6-methoxy-8-(γ -N-diethylamino-propylamino)-quinoline, analogous to Fournieu 710.

i Tareev and his collaborators (i) tested the drug in 94 cases and found that it caused a rapid disappearance from the peripheral circulation of the gametocytes in malignant tertian, and of all the stages in benign tertian and quartan malaria, in Q and BT a complete clinical cure was obtained in the majority of cases, whereas in MT and in hyper-toxic forms of BT it was necessary to combine plasmocide with quinine treatment. The parasiticidal and therapeutic effects of plasmocide are similar to those of the German plasmoquine, but it is less toxic than the latter.

ii & iii. Similar results were obtained by Leiserman (ii) in 16 cases and by Miloslavski (iii) in 60, representing all the three forms of malaria

C. A. Hoare.

KRITSCHESKI (I. L.) & PINES (A. I.). Die Wirkung der Chinolin-derivate auf die Gametocyten von *Plasmodium praecox*. [**Action of Chinolin Derivatives on *Plasmodium praecox*.**—*Klin. Woch.* 1934. June 2. Vol. 13. No. 22. pp. 807-809.

A study of the action of chinolin derivatives on bird malaria.

The authors conclude that:—Plasmoquine given to *Spinus spinus* in 1 to 1,000 concentration destroys the power of the gametocytes to infect *Culex pipiens* in 12 to 24 hours after treatment. Plasmocide (6-methoxy-8-diethylaminopropylaminoquinoline) given to *Spinus spinus* in a concentration of 1 to 1,500 has a similar action. Neither plasmoquine nor plasmocide given in concentrations of 1 to 4,000 or 1 to 8,000 to *Spinus spinus* at the height of infection with *Plasmodium praecox* can destroy the power of gametocytes to infect *Culex pipiens* 24 to 28 hours after administration. So that both these, and probably

all chinolin derivatives, have the extremely valuable property of breaking the epidemiological chain which links the malarial vector with the object of infection

E. D. W. Greig.

STERNBERG (E. J.) Ueber die Wirkung des Präparates "R 123" gegen Vogelmalária. [The Action of "R 123" on Bird Malaria.] —*Ztschr. f. Hyg. u. Infektionskr.* 1934 Mar. 20 Vol. 116. No 1. pp. 1-3.

Observations on the action of a preparation of the quinine series, "R 123," on bird malaria.

In his tests the author did not employ canaries but siskins (*Spinus spinus*) and flax siskins (*Acanthus linaria*). The chemical formula of the preparation was not divulged. As a result of his experiments the author finds that the preparation is weaker than plasmoquine in its action on bird malaria, the chemotherapeutic index of "R 123" being 26.6, whilst that of plasmoquine is 40.

E. D. W. Greig.

BUTTLE (Gladwin Albert Hurst), HENRY (Thomas Anderson) & TREVAN (John William) The Action of the Cinchona and Certain Other Alkaloids in Bird Malaria. II.—*Biochem. J.* 1934. Vol. 28. No 2. pp 426-441. [18 refs.]

The action of the different alkaloids of cinchona bark in bird malaria showed that they were not equally efficient.

The authors used Roehl's method with canaries in an investigation of the relative efficiency of the 8 principal alkaloids of cinchona bark, viz. *l*-quinine, *l*-cinchonidine, *d*-quinidine, *d*-cinchonine, and the 4 dihydro-derivatives of each of these products known commercially as dihydroquinine, hydrocinchonine, etc., but referred to in this paper as dihydroquinine, etc. The drugs were given orally through a thin piece of rubber tubing. The first dose was given 4 hours after the injection of a strain of bird malaria. Subsequent doses were given at daily intervals for the next 5 days, making 6 doses in all. The potency was estimated in comparison with that of quinine by taking the average time after infection at which parasites appeared in a particular group, and comparing it with the average of the quinine group done at the same time. There appeared to be little difference in the toxicity of the different alkaloids; dihydroquinidine was possibly a little more toxic than the others. In the following table, the drugs are arranged in order of their therapeutic efficiency. The figures represent the dose of quinine necessary to produce the same amount of protection as unit dose of the other alkaloids; for example 0.2 parts of quinine had the same effect as 1 part of cinchonine.

Dihydroquinine 1-2.

Quinine 1.

Dihydroquinidine 0.5-1

Cinchonidine about 0.5.

Quinidine about 0.5.

Cinchonine less than 0.2

Dihydrocinchonine less than 0.2

Dihydrocinchonidine less than 0.2.

It is not claimed that the order in which the drugs are arranged in this table necessarily represents the order of antimalarial activity in man. But it is logical to assume that, if the alkaloids differ so much in their activity on the parasite experimented with, they will not be of equal therapeutic value in man.

Commercial samples of the primary cinchona alkaloids are impure, each alkaloid contains its own reduction product, for example, quinine contains about 20 per cent of dihydroquinidine, and cinchonine contains about 14 per cent. of dihydrocinchonine. This is even the case in well crystallized specimens, usually accepted by chemists and biologists as pure. Another type of impurity is due to the difficulty of completely separating the components of each of the two similarly optically active pairs from each other, *i.e.*, cinchonidine and quinine usually contaminate each other, as do quinidine and cinchonine. (See this *Bulletin*, Vol. 30, p. 849) W. F.

CHOPRA (R. N.) & GUPTA (B. M. Das). **Studies on the Action of Quinine in Monkey Malaria.**—*Indian Med. Gaz.* 1934. Apr. Vol. 69. No. 4. pp. 195–203. With 4 figs.

The immediate response to quinine is slower than that to atabrin, but if the monkey survives it is much less likely to relapse after quinine.

P. knowlesi produces an intense and fatal infection when inoculated into rhesus monkeys. Treatment with atabrin quickly causes the disappearance of parasites but, even after a 5-day course with large doses, the parasites reappear within 10 to 15 days and the animal dies if left untreated; the recrudescence is, however, easily controlled by a single dose of atabrin. Quinine acts much more slowly than atabrin. In very heavy infections, death may take place in spite of a single daily intravenous injection of the largest doses tolerated, probably because quinine disappears so quickly from the blood, but quinine injections are very effective if they are repeated every 4 or 5 hours. The results with intramuscular injections are rather better. Unlike treatment with atabrin, treatment with quinine is not regularly followed by relapse. In many cases there is none, and in those where it occurs it is usually mild and tends to spontaneous cure though there are occasional fatal cases.

W. F.

PAYLOVA (P.). Der Einfluss der einmaligen Chiningabe auf den K- und Ca-Gehalt im Kaninchenserum. [**Effect of Single Doses of Quinine on the K and Ca Content of Rabbit Serum.**]—*Med. Parasit. & Parasitic Dis.* Moscow. 1933. Vol. 2. Nos. 4–5. pp. 258–260. [In Russian. German summary p. 260.]

The authors estimated the potassium and calcium content in the serum of rabbit before and after the introduction of quinine into the blood. A physiological solution of saline containing 2 per cent. quinine hydrochloride was injected subcutaneously into seven rabbits in doses containing 0.0016 gm. per kilo of body-weight. It was found that after $\frac{1}{2}$ hour the K content increased (by 8.8 per cent.), while the Ca content remained unaltered; after 2 hours the K content decreased by 7.3 per cent. though remaining above the normal, but there was an increase of 14.1 per cent. of Ca.

C. A. Hoare.

WARASI (W.). Ueber das Problem der Chininwirkung. [**On the Action of Quinine.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934. June. Vol. 38. No. 6. pp. 222–232. [37 refs.]

An experimental study of the adsorption of quinine by the red cells. The author concludes from his observations that:—The adsorption of quinine by the red cells of the blood is proportional to the quinine

concentration when the quantity of red cells is constant; conversely the adsorption is proportional to the quantity of red cells when the quinine concentration is constant. The absorption coefficient of red cells for quinine equals 14.7. Carbon dioxide does not displace quinine from the red cells. Arsenic lowers the adsorption power of red cells for quinine. By the action of quinine the colour of the red cells goes from light to dark red (methaemoglobin), but in the presence of arsenic the colour of the red cells remains light red. This appearance can be used as an indicator for detecting the action of arsenic on quinine adsorption by red cells.

E. D. W. Greig.

BOYD (Mark F.) & STRATMAN-THOMAS (Warren K.). **On the Duration of Infectiousness in Anophelines harboring *Plasmodium vivax*.**—*Amer. Jl. Hyg* 1934. Mar Vol. 19. No. 2. pp. 539-540.

No infection was conveyed by mosquitoes in whose salivary glands sporozoites had appeared more than 50 days before their application.

The results obtained in infecting man by the bites of mosquitoes are not so good in the first ten-day period as in the second ten-day period following the appearance of sporozoites in the salivary gland of the mosquito. After 20 days, the effectiveness of the mosquitoes deteriorates, and the authors have not succeeded in conveying infection after 50 days. The mosquitoes were kept in cold storage and fed once a week on rabbits. Depletion of sporozoites through these feeds undoubtedly occurred, but deterioration was also a factor. Sporozoites in recently matured infections are almost straight; those in old infections are curved.

W. F.

ROBIN (L. A.) & TOUMANOFF (C.). **Premières notions sur la réceptivité expérimentale de quelques anophèles de la Cochinchine et particulièrement de *A. vagus*, Don. [Infectibility of *A. vagus* in Cochinchina.]**—*Bull. Soc. Méd.-Chirurg. Indochine*. 1934. Feb. Vol. 12. No. 2. pp. 245-252.

Anopheles vagus Don. was readily infected experimentally with *P. falciparum*. The absence of infection among the very large numbers of this species examined in Cochinchina cannot, therefore, be due to incapacity for infection, but must be attributed to its feeding on animals and not on man. This hypothesis was supported by precipitin tests which showed that buffalo blood was the commonest meal of this mosquito.

W. F.

ROZEBOOM (L. E.) & SHAH (K. S.). **Preliminary Studies on the Production of Bird Malaria Infections by the Injection of Sporozoites.**—*Jl. Parasitology*. 1934. Mar. Vol. 20. No. 3. p. 198.

Mosquitoes (*Culex pipiens*) were fed on canaries infected with *Plasmodium cathemerium*. The mosquitoes were dissected 15 days later, and suspensions of glands containing live sporozoites were made in Locke's solution. Clean canaries were inoculated with various quantities of this suspension, and it was found that only those birds who received more than 200 sporozoites became infected. Birds with latent infections could not be superinfected by the inoculation of sporozoites. The sporozoites did not remain alive for more than about 2 hours at a temperature of 5°C.

W. F.

SCHILLING (Claus). Antikörper und Anfangsieber bei Malaria. [**Antibodies and Initial Fever in Malaria.**—*Zent. f. Bakt. I. Abt. Orig.* 1934. Feb. 28. Vol. 131 No. 1/2 pp. 25-33 With 4 figs]

In this communication the author elaborates a hypothesis of the pathogenesis of malaria.

The introduction of malaria therapy by WAGNER VON JAUREGG has made possible a direct attack on the problem of the interchanges between the antigen of the parasite and the metabolic products of the body. The author refers to his previous work in this connexion and also to the recent investigation of NEUMANN on antibodies and immunity in human malaria [this *Bulletin*, Vol. 30, p. 859].

His hypothesis of malaria is built up on the following data.—The demonstration of antibodies during the paroxysm (NEUMANN), the peculiar course of the initial fever, the typical intermittent fever following, the failure of initial fever in relapses and reinfections.

In discussing his hypothesis of the pathogenesis of malaria the author states that the results of the malarial infection express themselves in manifestations due to the action of toxin, and to the production of antibodies. The toxic symptoms arise when the amount of toxin has reached a certain threshold limit. At this time the number of circulating parasites varies very greatly in different persons. It is not the number of parasites and, probably, not the amount of toxin which determine whether or not the body will show a febrile reaction, but the sensitiveness of the infected individual. Therefore the period between the infection and the first rises of temperature (precubation of Wethmar, incubation I of van Assendelft) varies greatly. The initial febrile paroxysms vary so much in individuals that van Assendelft described 5 types.

The toxin acts longer in malignant tertian than in benign tertian or quartan infection and this is probably explained by the fact that the *P. falciparum* withdraws into the internal organs and is less exposed to antibodies circulating in the blood. The similarity of the subjective and objective symptoms indicates that the same toxin is produced by the different generations of parasites.

The second function of the parasite is the antiparasitic antigen; this in the author's opinion originates from the bodies of lysed parasites.

In the incubation period and in the initial febrile attacks a struggle between the antigen and antibodies is taking place. The most marked rise in the parasite curve is always at the end of the incubation period and beginning of the febrile attacks. This is due chiefly to the unhindered increase of an antibody-resistant generation. The typical febrile reactions are produced by antibody resistant generations of parasites.

He explains the failure of second inoculations, where no febrile attacks occur, only a few parasites in the blood, by the conception that the increase of parasites is hindered by a residue of antibodies and that the toxin production does not reach the necessary threshold limit; a low rate of increase reduces the probability that antibody-resistant generations can be formed.

van Assendelft notes that in cases of second infection which had previously undergone treatment or who gave a definite history of malarial attacks (called by him relapse cases, but more correctly designated fresh infections) the malarial paroxysm starts in about 90 per cent of the cases without preliminary temperature rises. Here there is a generation of parasites which has reached a certain degree of resistance to antibodies settled in the body of the host, which has a residue of protective bodies and from the previous infection has become allergic. This explains the cases in which repeated injection of blood containing parasites fail to produce attacks, but the bite of an infected anopheles leads to infection.

He notes that the experimental basis of his hypothesis shows considerable lacunae; nevertheless he believes that by stating the

problem other investigators may be stimulated to test it experimentally. The detailed discussion of the author's views should be read in the original paper by those interested

E. D. W. Greig.

TAREEV (E.), EPSTEIN (E.) & GONTAEWA (A). Zum Studium des Biochemismus der Rezidivbereitschaft bei Malaria. [**Biochemical Basis of Malarial Relapse.**—*Med. Parasit. & Parasitic Dis.* Moscow. 1933. Vol 2 No. 3. pp. 170-177. [In Russian, German summary p. 177.]

With the view to throwing some light on the biochemical basis of malarial relapses the authors have analysed the blood of 40 malarial cases (of all the three varieties) with special reference to the decrease of cholesterol, increase of sugar and decrease of reserve alkalinity, all of which are regarded as the usual concomitants of malarial infection. It was found that fresh and relapse cases of acute malaria are characterized by insignificant fluctuations of blood sugar and reserve alkalinity whereas there is a pronounced diminution of cholesterol. The degree of hypocholesteremia depends primarily upon the number of attacks immediately preceding the examination of the patient. A comparison of persistently relapsing cases of malaria with a number of mild ones revealed no difference between the two groups as regards the figures for cholesterol, sugar and reserve alkalinity. It would thus appear that the biochemical deviations of the blood have no prognostic value and cannot serve as a clue to the constitutional factors governing the malarial process.

C. A. Hoare

TSCHILOW (Konstantin) with MLADENOW (Iw). Beitrag zur Funktion der Leber bei Malaria. Belastung mit Galaktose und kombinierte Belastung mit Insulin-Glykose-Wasser. [**Liver Function in Malaria.**—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934. July. Vol. 38. No. 7. pp. 282-287. With 6 figs.]

The authors tested the liver efficiency in malaria by three methods and record the results.

Firstly they administered to 12 malarial patients 40 gm. of galactose per os and tested the urine thereafter. The urine contains only a little sugar if the liver is normal, but if there is liver damage then over 3 gm. may be found. In the malaria cases examined the reaction was negative; the urinary sugar never exceeded the physiological limits. Secondly they examined the blood sugar after administration again of 40 gm. galactose; a rise of 30 mgm. per cent. above the fasting blood sugar level indicates diminished efficiency of liver function. In the malaria cases it was found that either the rise of blood sugar was within normal limits, or it exceeded that level with, at the same time, pathological galactosuria, which indicated a disturbance of liver function. Thirdly, having determined the fasting blood sugar level, 20 units of insulin were injected, 20 minutes later the patients received 50 gm. glucose in 500 cc. water and then water up to 1,000 cc per os. The blood sugar level was determined at intervals of 36, 60, 120 and 180 minutes thereafter. During the period of investigation the patient remains fasting. The difference from the fasting sugar level should not exceed 20 mgm. per cent.; in patients with damaged-liver the difference exceeds this quantity. In the malaria cases examined some showed no abnormality, but in the majority of cases a disturbance of

liver function was determined by the test, the difference between the fasting sugar level and the peak of the hypoglycaemic blood sugar level exceeding 25 mgm. per cent. In many malarial cases there was a delay in reaching the normal maximum of the blood sugar level.

E. D. W. Greig.

SERGEANT (Edm.), SERGEANT (Et) & CATANEI (A). Essais de vaccination pré-munitivie contre le *Plasmodium relictum* [Premunition against *P. relictum* by Vaccination.]—*Arch. Inst. Pasteur d'Algérie*. 1934 Mar. Vol. 12. No. 1. pp. 10-12.

Blood rich in *Plasmodium relictum* was mixed with citrate solution and glycerine, and kept at room temperature for varying periods before being inoculated into canaries. Blood which had been kept for 2 or 3 days retained its virulence, but blood which had been kept for 4 days produced no disease and seldom premunition. Thirteen birds were inoculated with blood 4 days old, and premunition occurred in only one. Better results have been obtained by inoculating sporozoites. W. F.

ISHIOKA (Hyozo). Isohaemagglutination in Malaria.—*Taiwan Igakkaï Zasshi* (Jl. Med Assoc. Formosa) 1934. Mar Vol. 33. No. 3 (348). [In Japanese pp. 433-442. With 2 charts. [23 refs.] English summary pp. 35-36.]

The author examined the blood of 23 patients during treatment, and for 8 weeks afterwards. He used his own blood as the standard. He found that, in a healthy man, the titres of haemagglutinin and haemagglutininogen, in *a*-type serum and *b*-type corpuscles remained constant, but that they were lowered in malaria. They rose during treatment and continued to do so afterwards. W. F.

PEZZERI (V.). Il metabolismo basale nella infezione malarica. [Basal Metabolism in Malaria.]—*Riv. di Malarologia*. 1934. Vol. 13. No. 2. pp. 174-181. [19 refs.] German summary (8 lines).

In 23 cases of malaria where the basal metabolism was investigated, higher values were always obtained during apyrexia in all three types. The author attributes this, firstly, to the access of fever and, secondly, to blood destruction, changes in the vegetative nervous system, circulatory disturbance, and splenomegaly. W. F.

MOUFEL (P.) & ANDREEVA-BUDYLINA (V.). Révision de la valeur diagnostique de la réaction cutanée dans le paludisme. [Diagnostic Value of Skin Reaction in Malaria.]—*Médec. Parasit. & Parasitic Dis.* Moscow. 1933. Vol. 2. Nos. 4-5. pp. 256-258. [In Russian. French summary p. 258.]

In 1931 TSECHNOWITZER and MOLDAWSKAYA-KRITCHEWSKAYA published the results of observations on the cutaneous reaction produced with "malaren-antigen" prepared from plasmodia [this *Bulletin*, Vol. 29, p. 717].

The present authors tested this reaction on 62 cases of malaria, with 72 controls, and obtained a positive reaction in 72 per cent. of the former and in 66.6 of the latter. The reaction thus proved to be of no diagnostic value and its use was discontinued. C. A. Hoare.

DHONT (C. M.), Jr. Over een serologische reactie op malaria (reactie van Henry). [**Henry's Reaction in Malaria.**]*—Nederl. Tijdschr. v. Geneesk.* 1934. May 19. Vol. 78. No. 20. pp. 2188-2197. With 1 fig. [20 refs.] French summary.

Henry's reaction, first published in 1927, is a sero-flocculation in which the antigenic reagent used is not the cytoplasmic substance of the malaria parasite but the melanin produced by blood destruction. As a matter of fact there are two tests corresponding to two artificial antigenic substances. These are an albuminate of iron and a solution of melanin in distilled water which is obtained from the choroid of the ox's eye. As the first of these two reactions is much less specific than the second there seems little reason to apply both tests. As regards specificity, it may be said that a negative reaction is given by all healthy persons and a positive reaction in all malaria cases, with the melanin solution. In the case of diseases other than malaria, and where there is no malaria history, a positive reaction may sometimes be obtained. Such cases were haemolytic icterus, septicaemia due to haemolytic streptococci, Hanot's hepatic cirrhosis and one very exceptional case of typhoid fever. According to the author's own investigations cases of Weil's disease showed decided tendency to a non-specific flocculation. Whether these exceptional cases are referable to blood destruction, jaundice or disturbance of albumin-globulin equilibrium will require further investigation. Sera with positive Wassermann reaction do not give a Henry's reaction. The reaction has undoubtedly an application, particularly in cases where no parasites are apparent in the peripheral blood.

W. F. Harvey.

CHORINE (V.) & KOEHLIN (D.). Influence de la conservation des sérums sur la réaction de Henry. [**The Influence of Conservation of the Serum on Henry's Reaction.**]*—C. R. Soc. Biol.* 1934. Vol. 116. No. 16. pp. 19-21.

The authors reach the following conclusions as the result of observations made with the Vernes-Bricq-Yvon photometer upon sera examined over a period of 10 days. In a serum which has been separated from the clot, the reaction varies from day to day in the form of a sinusoidal curve; but, if the serum is left in contact with the clot, there is a steady, slow decline. The test should therefore be made as soon as possible after the blood has been collected, and the serum should not be separated from the clot until it is needed. The photometric variations in normal sera, and in sera which have been artificially made positive, follow the same course.

W. F.

TRENSZ (F.). Le rôle des différents composants du réactif mélanique de Henry dans la séroflocculation palustre. [**The Action of the Different Components of Henry's Melanin Reagent.**]*—Bull. Soc. Path. Exot.* 1934. Apr. 11. Vol. 27. No. 4. pp. 333-338.

Pure melanin pigment gives the highest optic densities with Vernes's photometer, but the addition of either vitreous or formalin renders the reaction more readily visible to the naked eye, because it assists in the formation of grosser floccules.

W. F.

HENRY (A. F. X.) A propos de la densité optique dans les techniques sérologiques, photométriques et en particulier dans la malaria-flocculation [The Optic Density in Photometric Serology, Particularly in Henry's Flocculation Tests.]—*C R Soc Biol.* 1934. Vol. 115. No. 14 pp 1606-1609.

This concerns the reading of the results of Henry's flocculation tests by means of Vernes's photometric methods, and should be read in the original by those who wish to make use of them. W F

SINTON (J. A.), GHOSH (B. N.) **Studies of Malarial Pigment (Haemozoin). Part I. Investigation of the Action of Solvents on Haemozoin and the Spectroscopical Appearances observed in the Solutions** [SINTON & GHOSH].—*Records of the Malaria Survey of India* 1934. Mar. Vol. 4 No 1 pp. 15-42. [94 refs.] **Part II. The Reactions of Haemozoin to Tests for Iron** [GHOSH & SINTON].—*Ibid.* pp. 43-59. [33 refs.]

Malarial pigment, or "haemozoin," differs from the pigment of the skin and eye, or "melanin," and is probably identical with haematin.

Most authorities consider that malarial pigment is formed by the digestive action of the parasites upon the haemoglobin of the red cell, the globin being used as nutriment and the haemin remaining as a waste product. Malarial pigment was at one time thought to be identical with the black pigment known as melanin which is found in the skin, the eye and melanotic tumours. Many workers have shown that this view is not correct, true melanin is insoluble in strong ammonia, alkaline and acid alcohol, ammonium sulphide, and several other solvents of malarial pigment. The name "haemozoin," which is now generally used for malaria pigment, was first proposed by SAMBON. Former investigations of haemozoin have been made on pigment derived from tissues preserved in fixatives. The authors have studied it in the blood. They used the blood of a *rhesus* monkey infected with *P. knowlesi*. Infection of this monkey with this malaria parasite is so massive that sometimes half the corpuscles contain parasites, and therefore a good supply of pigment was obtainable. The authors found a very marked resemblance between the action of various solvents upon haemozoin and upon haematin. They studied the spectra of haemozoin in different solutions, and the action of various reagents on such spectra. A comparison of the results with those obtained with haematin showed that they were identical. They obtained no evidence of ionisable iron in haemozoin, but they succeeded in demonstrating non-ionisable iron by using a preliminary unmasking treatment with reagents such as H_2O_2 , HNO_3 acid alcohol and $(NH_4)_2S$. "A close resemblance has been found between the reactions of haemozoin and haematin with the tests employed. These results support the view that these two pigments are very similar and are probably identical." W. F.

TALIAFERRO (William H.); TALIAFERRO (Lucy Graves); CANNON (Paul R.). **The Transmission of *Plasmodium falciparum* to the Howler Monkey, *Alouatta* sp. I. General Nature of the Infections and Morphology of the Parasites** [TALIAFERRO & TALIAFERRO].—*Amer. Jl. Hyg.* 1934. Mar. Vol. 19. No. 2. pp. 318-334. With 3 figs. **II. Cellular Reactions** [TALIAFERRO (W. H.) & CANNON].—*Ibid.* pp. 335-342. With 3 plates. [27 refs.]

Describes the production in monkeys of transient infections with *P. falciparum*, by means of inoculation of large quantities of blood.

MESNIL and ROUBAUD reported in 1917 the successful transmission of *P. vivax* to a chimpanzee. Parasites were present, in different stages, from the 13th to the 22nd day. Experiments by other workers have been entirely negative, or have caused only fleeting infections, with the exception of those reported by YOSHINO (1926) [this *Bulletin*, Vol. 24, p. 276.]

The authors inoculated 9 infant howler monkeys from Herrera, Panama, with citrated, centrifuged, washed corpuscles from 9 cases of subtertian malaria. The monkeys were very small, they weighed only 440 to 645 grams, and they were inoculated intravenously with relatively enormous quantities of blood, 10 to 20 cc; in one monkey, there were 380 parasites to every 10,000 cells immediately after inoculation. The infections persisted for longer than three days in three of the monkeys. A gradual increase in the cytoplasm of the inoculated subtertian rings took place, occasionally Maurer's dots were seen, within 30 to 40 hours coarse pigment granules appeared; segmentation began when the parasite half filled the cell, and by the time the complete rosette had formed, it filled it completely, there were usually 16 to 24 merozoites. Sporulation occurred approximately every second day, in a monkey whose infection persisted for nearly 6 days, there were 3 sporulation periods characterized by enormous increases in the numbers of the parasites, in one of these accesses there were 915 parasites in 10,000 cells. Only asexual stages occurred; no crescents were found. The fully developed schizonts, or "segmenters" in the peripheral blood were too few to give origin to the large numbers of young ring forms, and the authors found "conclusive evidence of reproductive activity of the parasites elsewhere than in the peripheral blood," namely, in the spleen and to a less extent in the liver and bone marrow. Pigment occurred in the macrophages of the spleen, liver and bone marrow. No general lymphoid activation occurred, and the sluggishness of the tissue reaction suggests that the parasites were disposed of easily. A single attempt was made to convey the human infection from one monkey to another, but it was not successful. [See also this *Bulletin*, Vol. 30, p. 86.] W. F.

IONESCO-MIAHAIESTI (C.), ZOTTA (G.), RADACOVICI (E.) & BADENSKI (G.). Transmission expérimentale à l'homme du paludisme propre des singes. [*Monkey Malaria transmitted to Man.*].—C. R. Soc. Biol. 1934. Vol. 115. No. 12. pp. 1311-1313.

A baboon was inoculated with the blood of another baboon infected with *P. mui*, and died 8 days later with a very heavy infection. Some of its blood was inoculated into a *Macacus rhesus* monkey, and some was inoculated intravenously into a human volunteer. The monkey died from malaria on the eighteenth day. The man developed quotidian malaria on the ninth day, and the attacks became so severe that it was necessary to give him an injection of quinine about 10 days later. This caused the disappearance of the parasites, and there was no relapse. Only ring forms were found in the blood. The blood of this man was inoculated into a *Macacus rhesus* monkey, and also into two human volunteers. Parasites appeared in the monkey on the fifth day, and it died five days later. Quotidian fever commenced in the volunteers after 10 days' incubation and, in them, both rings and schizonts were found. W. F.

BRUG (S. L.). **Observations on Monkey Malaria.**—*Riv di Malariaologia* 1934. Vol. 13. No. 2 pp. 121-142. With 11 figs.

Natural infections in *Macacus cynomolgus* are not usually pure, but are mixed infections due, for example, to *P. knowlesi* and *P. inui*. Pure infections are obtained by inoculation and subinoculation in monkeys. The author found that the period of the schizonic cycle in *P. knowlesi* was 24 hours. The morphology corresponded to SINTON and MULLIGAN's description (p. 461, above), but in addition, a halo round the nucleus of the stained parasite was noticed. Another feature was the presence of band-like parasites, resembling those seen in quartan malaria. These occurred in patches, in thin films; they were not seen in thick films probably because the drying was slower and the parasites had time to assume a globular form. On an average, there were 9 merozoites in the schizonts. *P. knowlesi* produced a rapid anaemia in *Macacus rhesus*: for example, in one monkey, 5,700,000 corpuscles on the 11th day sank to 1,660,000 on the 15th day. The number of corpuscles destroyed was far greater than the number of parasites present, and the author attributes their destruction to a toxin produced by the plasmodia. In the naturally infected *Macacus cynomolgus* from which this strain was isolated, the infection was very scanty, and, though it persisted, the animal appeared quite healthy. One strain investigated by the author differed from typical *P. knowlesi* in the following particulars:—(1) the corpuscles were rarely distorted, (2) the pigment was in the form of rods, (3) the parasites had purple stained borders, like those seen round crescents. He calls this form *P. knowlesi* var. *sintoni*.

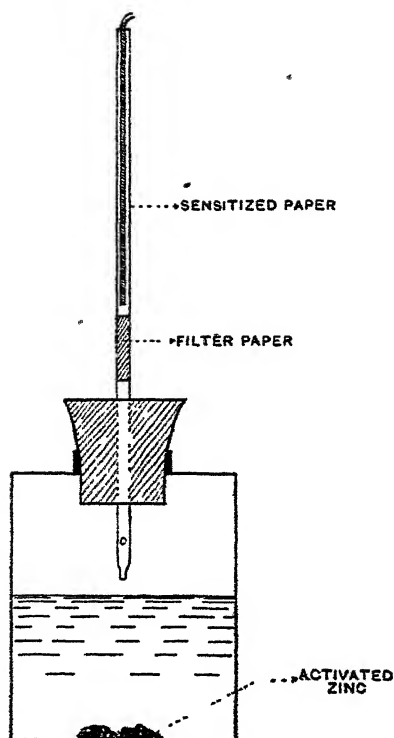
The investigation of *P. inui* was handicapped by the death of the monkeys from intercurrent infections. The plasmodial infections were slight, and appeared to have little effect on their health. The periodicity was tertian. The occurrence of Schuffner's dots was not nearly so constant as in human tertian. W. F.

SCHWETZ (J.). Contribution à l'étude des parasites malarieux des singes supérieurs africains. [**Malaria Parasites in African Apes.**]—*Riv. di Malariaologia*. 1934. Vol. 13. No. 2. pp. 143-147. With 29 coloured figs. on 1 plate.

The author has kept under observation two chimpanzees with naturally acquired, multiple infections. The first, examined over a period of 10 months, was naturally infected with benign tertian, subtertian, and quartan parasites. The second, which was about six months old was naturally infected with *P. falciparum* and *P. vivax*. The parasites were absolutely identical (? morphologically) with the human forms. The benign tertian and quartan infections died out comparatively early, while the subtertian persisted much longer. The same thing happens in the human population. *P. tenue* forms were found in both monkeys. An excellent coloured plate is given. (See p. 461, above.) W. F.

MONNIER & MARTIN. Contribution au contrôle chimique de l'épandage du vert de Paris pour la destruction des larves d'anophèles. [**Chemical Control of the Distribution of Paris Green.**]—*Bull. Soc. Méd.-Chirurg. Indochine*. 1934. Feb. Vol. 12. No. 2. pp. 253-262. With 2 figs.

The sample of water which is to be tested for Paris green is cooled to 15°C., if necessary, and 50 cc. are put into the glass flask, shown in



Showing wide-mouthed glass flask, of about 120-150 cc capacity, fitted up for testing water samples for Paris green. A glass tube, 30 cm long by 6 mm diameter, with a small hole, 3 mm in diameter, at about 2 cm from its tapered end passes into the flask through a rubber stopper. Above the stopper this tube contains first a wad of filter paper and then a strip, 10 cm. long, of paper impregnated with mercuric chloride.

[Reproduced from the *Bulletin de la Société Médico-Chirurgicale de l'Indochine*]

the diagram, with 5 cc. of H_2SO_4 . A few drops of 1/1,000 KMnO_4 are added until a rose colour appears, and then the solution is decolourized with H_2O_2 . Next, some fragments of zinc (which have been activated by 10 minutes immersion in 10 cc. of water containing a drop of CuSO_4) are added. The stopper with the tube containing the sensitive paper, impregnated with mercuric chloride, is then inserted. After 3 hours, the sensitized paper is removed and immersed in a 10 per cent. solution of potassium iodide in order to fix the colour. The arsenic evolved produces a yellow colouration of the paper, which is turned brown by the potassium iodide. The more arsenic the water contains, the greater is the length of paper turned brown. When there are tenths of milligrams in a litre of water, about 5 cm. of the paper is coloured; when there are hundredths, about 1 cm.; when there are thousandths, only a few millimetres. Forty-eight hours after the application of 1 per cent. Paris green, none can be detected in the water by this reaction. This shows that there is no danger that applications repeated at the usual intervals can lead to a poisonous accumulation of arsenic.

W. F.

C

DE BENEDETTI (A). Sulla permanenza del verde di Parigi alla superficie delle acque stagnanti delarvizzate col metodo de Benedetti [**Permanence of Paris Green on Stagnant Water.**].—*Riv. di Malariologia*. 1934. Vol. 13. No 2 pp 211-216 English summary.

"From the author's experiments it results that Paris green mixed at the rate of 2 per cent. with earth prepared according to the author's method, persists on the surface of stagnant waters and shows larvicide power at least 24-25 days after the spreading. Then in the best environmental conditions and in the dry season, it will be sufficient to repeat the treatment about every 30 days.

"It is evident that the conditions change whenever rain falls or violent winds occur, or if there are running waters. A determination of the arsenic should be made by means of Gutzert's reaction for establishing the necessity of repeating the antilarval spreading

"From the economical and practical standpoints this method seems to present remarkable advantages." W F

SWELLENGREBEL (N. H.). 7 jaar ervaring over anopheles bestrijding in Medemblik. [**Seven Years of Anti-Mosquito Measures in Medemblik.**].—*Nederl. Tijdschr. v. Geneesk* 1934 Jan. 20. Vol. 78. No. 3. pp. 345-353.

An extensive trial of Schweinfurth (Paris) green as a means of killing mosquito larvae has been made in Holland by the author. The results have not been satisfactory even by treatment of all breeding places inside a radius of 3 kilometres. Thus, when the cost of the procedure is considered and the relative unimportance of the disease, it does not seem wise to recommend it as advisable for a country like Holland, however suitable this antimalarial measure may be for other countries and other conditions. Methods of individual prophylaxis have been found much more satisfactory and the use of a pyrethrum preparation for killing mosquitoes, especially in stables, is highly recommended. Commercial preparations are effective but costly and there is little difficulty in making as good insecticides as "Sheltox" and "Fht."

W. F. Harvey.

NIJKAMP (J. A.) & SWELLENGREBEL (N. H.). Proeven over anopheles vernietiging met pyrethrumpraeparaten. [**Mosquito Extermination with Pyrethrum Preparations.**].—*Nederl. Tijdschr. v. Geneesk*. 1934. May 26. Vol. 78. No. 21. pp. 2327-2338. With 6 figs. on 2 plates. English summary.

An active campaign against mosquitoes is carried on in Holland as an approved anti-malarial measure. The mosquitoes are killed in stables and in houses and pyrethrum extracts have been found to be very efficient lethal agents. Stables were mostly used for the tests. The pyrethrum consisted of the ground flower heads of the type Dalmatian IA. Various extracting agents were tested such as petroleum ether, sulphuric ether, ethylene trichloride and carbon tetrachloride, and the order given is the order of efficiency. Stables and houses are treated by spraying through a fine atomizer under compressed air pressure of $1\frac{1}{2}$ to 2 atmospheres and the mosquito is killed by the impact on it of a fine droplet. The final formula of the spray material arrived at was, petroleum (with much naphtha and high boiling point) 1,000; pyrethrum-extract 5; sassafras oil 5, methyl-salicylate 20, and this costs 0-12 florins for spraying 100 cubic metres, a

price which is low in comparison with commercial preparations. For stables the amount of sassafras oil should be increased to 10 cc. Methyl-salicylate has no lethal effect on mosquitoes but serves to give the spray its fragrance. This insecticide makes no marks upon furniture, a very important matter when it is to be used within the house. Quantities to be used will vary, say from 2.5 to 4.8 cc. per cubic metre. Some extension of trials was made for other insects than mosquitoes. Flies (*Musca domestica*) required the addition of 10 instead of 5 gm. of pyrethrum extract per litre, bugs 25 gm. per litre and the use of at least 15 cc. per cubic metre, while fleas were not completely exterminated even with preliminary spraying of the floor by a 25 per thousand pyrethrum extract and the use of 10 cc. per cubic metre.

W. F. Harvey.

GINSBURG (J. M.) **Specifications for Mosquito Oils and Larvicides.**—*New Jersey Stat. Circ.* 291. 1933. 4 pp. [Summarized in *Experiment Station Rec.* 1934. June. Vol. 70. No. 6. pp. 810-811.]

"Experiments conducted have shown that fractions of petroleum boiling at from 200° to 550°F. are very toxic to mosquito larvae and pupae, giving a complete kill within 30 min. The higher boiling fractions possess lower toxicity, requiring several hours to kill, meanwhile allowing mature pupae to develop into adults. On the other hand, the low boiling fractions possess high volatility and rapidly evaporate from the surface of the water, whereas the high boiling fractions do not volatilize and only slowly decompose, leaving an oil film on the water for a long time, thus preventing oviposition and hatching of mosquito eggs. A mixture of these fractions in proper proportions produces an oil which is highly toxic to larvae and lasts for 8 days or longer. Such an oil can be readily prepared by mixing low grade kerosene or a similar cheap light fuel oil with various proportions of either heavy distillate fuel oil or crank-case waste oil. Application of the oil may be made with equipment varying from the ordinary hand sprayer to the airplane.

"It is pointed out that while petroleum oil is at present the most reliable larvicidal agent on both fresh and salt water, where it cannot be employed due to its poisoning fish and water-fowl and injury to aquatic plants a pyrethrum larvicide has been found satisfactory. This consists of kerosene extract of pyrethrum equal in strength to 20 lb. of pyrethrum flowers to the gallon and liquid coconut soap containing about 40 per cent. actual soap. In order to apply this larvicide on salt water, powdered skim milk or similar emulsifying agents which do not react with salt water, such as glue and various gums, should be used instead of soap."

QUAIFE (W. T.). **Further Remarks on the Brushing Method of Oiling.**—*Malayan Med. Jl.* 1934. Mar. Vol. 9. No. 1. pp. 38-39.

Brush-oiling is as efficient as spraying in *A. maculatus* areas, and requires only half as much oil.

The equipment required is a one or two gallon pail for the oil, a flat bamboo broom measuring eight or ten inches by five inches, and a small mop. The mop should be made of the hard outside part of coconut husk, bound with wire to a stick half an inch in diameter. The

free part of the husk should be 3 inches long, and 1 inch in diameter " These dimensions are essential as the use of a larger mop for scattering the oil will lead to waste " One man and a boy are needed. The boy walks ahead and at every fourth pace he stops, dips the mop into the pail and scatters the oil on the water-surface in front and behind him. The brusher walks behind, moving up stream, and brushes the water forward at an acute angle to the bank. The man and boy usually walk in the stream. Springs and small seepages must be especially attended to by the mopper. It is absolutely necessary to keep the drain beds edges very clean and free from weeds. The author gives the following example of the economy of brushing the cost of oiling on a 1,000 acre estate by the spraying method was \$672 in a year, but with the brush method it was only \$337. In the discussion which followed the paper, Dr. W. J. VICKERS stated that the brush method was now in use throughout the Kuala Lumpur area, and had effected a saving in oil of 50 per cent. No larvae more than 4 days old had ever been found in the oiled area. Dr. C. H. WILLIAMS said that he had tried this method in an area where *A. ludlowi* was breeding, but it had not been a success. Possibly this mosquito is more resistant than *A. maculatus*.

W F

SCOTT (G. Waugh). **Fascine Drainage in Mosquito Control.**—*Malayan Med. J.* 1934. Mar. Vol. 9. No. 1. pp 65-66. With 3 figs

The method is as follows :—The drain is first cleaned out. A layer of round sticks is packed into the bottom of the drain until the normal water level is 6 inches below the topmost sticks. A layer of lallang (coarse native grass) is spread on the top sufficiently thick to prevent the access of mosquitoes to the water flowing through the sticks. The lallang thatch may be covered with a layer of earth. Such drains last about 6 months and are a cheap substitute for oiling. The method is suitable for drains, measuring 9 inches to 3 feet across.

W. F.

COLLIGNON (E.). De l'insuffisance des radiers plats pour la suppression définitive des gîtes à anophélines.—[**Inadequacy of Flat-bottomed Drains to prevent Mosquito Breeding.**].—*Arch. Inst. Pasteur d'Algérie*. 1934. Mar. Vol. 12. No. 1. pp. 26-28. With 3 figs.

A concrete drain which serves its purpose in draining the soil may yet provide breeding places for mosquitoes in Algeria during the dry season, when there is no more than a trickle of water flowing down it. Under these conditions green algae grow, and puddles are formed in the bottom of the drain. In order to avoid this, the drain should be provided with a small central gully, or lunette, towards which the bottom of the drain should be sloped.

W. F.

SICAULT (G.). Note sur l'adaptation du *Gambusia holbrooki* aux eaux salées. [**Adaptation of *Gambusia holbrooki* to Saline Water.**].—*Bull. Soc. Path. Exot.* 1934. May 9. Vol. 27. No. 5. pp. 485-488.

The author sought to know whether *Gambusia* could be used to keep down *Anopheles* in the saline water of the lagoons at the mouths of the Moroccan wadis.

From his experiments in his aquaria he concludes that *Gambusia* can be transferred at once to water containing 11 parts of sodium chloride per mille without diminution of its larvivorous capacity, and progressively to water of saline content of 33 parts per mille, exceeding that of sea water. Above 18 parts per mille the larvivorous activity lessens, at 36 parts it is nil and at this concentration the mortality is considerable. Indeed waters of salt concentration above 35 parts per mille is unsuited to *Gambusia*. CAZANOVE remarked that LE MOAL has reported larvae of *Anopheles* in marshes at Dakar the salinity of which reached 24 parts per mille.

A. G. B.

LEGENGRE (F). Introduction à Madagascar du *Gambusia holbrooki*. [Introduction of *Gambusia* to Madagascar.]—*Bull. Soc. Path. Exot.* 1934. Mar. 14. Vol. 27. No. 3. pp. 291-294. With 1 plate.

The author [not to be confused with his predecessor J. LEGENDRE] obtained from Corsica some specimens of *Gambusia*, thirteen of which eventually reached Antananarivo. They were put into a small pool at the Pasteur Institute and were later transferred to other natural waters. There are now many millions of them. They are described with a plate which shows the difference in size of the sexes and the characteristic markings. They live in sweet or brackish water, running or stagnant, provided they find food enough. They eat more larvae when the water edges are kept free of vegetation. The females produce 50-60 young 6-7 times a year. Some hints are given how to transport them.

A. G. B.

PALADINO-BLANDINI (A.) & MARINO-ASSERETO (P.). La chinoplasmina nella profilassi della malaria a Schiavonea (bonifica di Sibari). [Quinoplasmine as a Prophylactic.]—*Riv. di Malarologia* 1934. Vol. 13. No. 2. pp. 161-173. With 4 figs. [12 refs.] French summary.

The authors administered a prophylactic dose once a week to an isolated population of 978 persons living at Schiavonea in Calabria. The weekly dose for adults was 0.02 grams of plasmoquine and 0.6 grams of quinine sulphate. No primary infections occurred during the malaria season, except in one infant.

W. F.

SOESILO (R.) & GILBERT (A. Ph. W.). Report about Malaria-Prophylaxis and -Treatment with Atebrin.—*Meded. Dienst d. Volksgezondheid in Nederl.-Indië*. 1934. Vol. 23. No. 1. pp. 5-7.

Twenty-one volunteers were given prophylactic atebrin, and 11 controls were given none. All were then bitten by infected mosquitoes. Ten of the eleven controls became infected, but only 6 of the 21 who had taken atebrin. The amount of atebrin was 0.1 or 0.2 grams given between 5 and 24 hours before the mosquitoes were applied and continued daily for 4 to 6 days afterwards. Seventeen volunteers infected with *P. falciparum* were treated with atebrin 0.1 gm., three times a day for 5 or 6 days. They were kept under observation for 12 to 17 months, and only 3 relapsed. (See above, p. 474.)

W. F.

SWELLENGREBEL (N. H.). De splitsing der Anophelessoorten. [The Subdivision of Anopheles Species.].—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1934. June 5 Vol. 74 No. 12. pp. 706-711.

This article is a vigorous reply to the accusation, evidently launched by the hygienist, that continued subdivision of the *Anopheles* into species, races and varieties as at present practised is so much entomological pedantry (aanstellerij, kleinramerei) and quite unnecessary.

Why is it necessary to make special investigation in Java and Sumatra into the anopheline fauna, when it is known to be very similar to that of Malacca, where all the dangerous malaria-carrying species are already known? The answer is supplied in considerable detail. In Malacca and British India *ludlowi* is of less importance than in the Netherlands Indies, while in the Philippines it is of still less importance. For Malacca *umbrosus* and *maculatus* are the vectors. In Semarang, on the other hand, this rôle belongs to *ludlowi* on the coast and to *aconitus* and *maculatus* in the hill country. What the condition of affairs may be in Tajoe is not known, nor is there any disgrace in confession of this want of knowledge. It simply emphasizes the fact that local investigation must precede the application of practical measures. To continue the illustration—*sinensis* of Sumatra is, in regard to malaria, "other than" *sinensis* in Java. This term "other than," as applied to the same species of *Anopheles*, is explainable as due to the occurrence of local races. Take *ludlowi* with its *sundaica* as an example. In the Netherlands Indies *ludlowi* is a carrier of malaria but not in the Philippines. "Sundaica," therefore, becomes the symbol of the conviction that certain morphological characteristics make it possible to decide whether a given *ludlowi* is a vector or not. Such a conclusion is confirmation of the fact that museum specimens and groupings are really the mirror of groupings in living nature and that these collections are to be ranked higher than collections of postage stamps.

Other factors also go to clinch this argument for the fixity and validity of the entomologist's species, races and varieties. A reference to the widely distributed *maculipennis* will illustrate this. One race of this mosquito is the short-wing or *atroparvus*; it is the carrier of malaria in Holland, because it remains a blood-sucker in autumn. The other race is the long-wing or *messeae*, which does not transmit malaria, because it does not suck the blood in the autumnal malaria season. The short-wing race breeds in brackish and in salt water, the long-wing only in fresh water. Malaria in the Netherlands is a brackish water product, a fact which was already known long before the era of plasmodia and anopheles.

The factor of interfertility is another important distinction for the establishment of true species, notably among butterflies. It has been found to apply to the mosquito races just considered. Short-wing *maculipennis* mates in cages and captivity but long-wing does not. Moreover, although the two races can be crossed in both directions, eggs may be laid, and even embryos develop, still none of the larvae are viable. Similar experimentation with another race of *maculipennis* called *typicus* and *atroparvus* showed production of hybrids but that the male hybrid produced no spermatozoa and the female no egg follicles. Thus the reply can be made to the critical hygienist that anopheles species and races are of definite importance in malaria practice and careful entomological analysis is not mere pedantry.

W. F. Harvey.

ROUBAUD (E.) & TREILLARD (M.). Influence de la nourriture larvaire sur le développement et le comportement agressif des anophèles. Note préliminaire. [Influence of Diet of Larvae on Development and Aggressive Behaviour of Anopheles.]—*Bull. Soc. Path. Exot* 1934. May 9. Vol. 27. No. 5 pp. 461-467.

The authors have fed larvae of *Anopheles maculipennis messeae* in different ways ; they observe the effects upon the larvae and upon the adults which emerge from them.

The paper describes a number of experiments, nearly all of them carried out in duplicate : groups of larvae brought from the same batch of eggs were treated identically, except that some were fed on powdered spleen, others on powdered leaves, and others on mixed diets. The adults were put in small cages and offered blood in a standard way daily. The authors observed differences in the mortality and rate of growth of the larvae and in the size of larvae and adults, they also found that females from larvae fed on vegetable diet took blood earlier than others.

A number of possible explanations of these facts will occur to the reader. It is not, for instance, certain that the different types of food were all supplied in ample quantities : it follows that differences in growth or mortality might be due to partial starvation or to one food being really better than another. The authors' own explanation of some of the experiments is that those larvae which were fed on spleen stored up nitrogen, and thereby produced adults which were less avid for blood because they had less need for protein, from which to produce eggs. The view would gain support if it had been shown that larvae or pupae fed on spleen actually contained more protein than others, but much work of a solid biochemical nature must be done before we can accept or reject the interesting generalizations with which the paper concludes.

P. A. Buxton

DE MEILLON (Botha). Entomological Studies—Observations on *Anopheles funestus* and *Anopheles gambiae* in the Transvaal.—*Publications of South African Inst Med. Res.* 1934 Feb. No. 32. pp. 199-248. With 4 maps, 7 graphs & 5 figs. [11 refs.]

Of the two malaria vectors mentioned in the title of the present contribution, both of which are very widely distributed in Africa south of the Tropic of Cancer, the former, in the Transvaal at any rate as already shown by the author (see this *Bulletin*, Vol. 30, p. 608), appears to be represented by two races, one of which frequents human dwellings and is found in endemic malarious areas, while the other shuns habitations and occurs where malaria is absent. While *A. funestus* breeds in permanent streams rising in the Drakensberg, *A. gambiae*, which is associated with malarial epidemics, prefers to oviposit in small temporary pools in river beds, and in backwaters. For the existence of the house-frequenting race of *A. funestus*, which is not met with above 2,500 feet, the requisite conditions are.—an annual rainfall of at least 30 inches ; a mean temperature of 61°F. or more ; and a range of temperature not exceeding 40°F. The eggs of *A. gambiae* are relatively more resistant to desiccation than are those of *A. funestus*, but larvae of the former species, if exposed to the sun on wet mud, soon perish. In selecting a breeding place, the gravid female of *A. gambiae* appears to be influenced to some extent by the food content of the water.

A meal of blood is a necessary preliminary to the development of the eggs in *A. funestus* which, having entered a human habitation on

hatching, only forsakes it when the eggs are ready to be laid. *A. gambiae*, on the other hand, after entering a dwelling in the evening, may leave early next morning and spend the day underneath stones or in crevices. Though a 5-candle power lamp will not exclude *A. funestus*, a light of 300-candle power was found to be an effective safeguard. While both sexes of *A. funestus* may travel so far as two miles from their hatching-place, eighty per cent. of the specimens remain within a radius of half-a-mile; in one instance, however, two females flew four and a half miles in order to feed. As a repellent against the attacks of *A. funestus* there is much to be said for citronella oil, which is so popular in South Africa; but it must be applied thoroughly, and at intervals not longer than five hours.

E. E. Austen

1. STUART (G.). **The Anopheline Mosquitos of Palestine.**—*Jl. Egyptian Med. Assoc.* 1933. July. Vol. 16. No. 7. pp. 769-776
- ii. REITHER (R.). **On the Autumnal Migration of *Anopheles elutus* in the Lake Huleh Territory.**—*Ibid.* pp. 777-782 With 2 figs.

i The Palestine fauna includes nine species of Anopheles, but of these *A. mauritanus* and *A. pharoensis* are of rare occurrence and no practical importance. Of the remainder, *A. bifurcatus*, which in Palestine breeds almost exclusively, and practically throughout the year, in household wells, cisterns and other water receptacles, is the disseminator of urban malaria; while *A. elutus*, *A. superpictus*, *A. sergenti*, *A. algeriensis*, *A. multicolor* and *A. hyrcanus* are rural species. Among the latter group, *A. hyrcanus* and *A. algeriensis* are "wild" mosquitoes, which do not visit houses and are therefore negligible as vectors.

Although evidence from dissection is incomplete, on epidemiological grounds *A. multicolor*, a wide-ranging brackish water breeder, appears to have little to do with the spread of malaria. *A. sergenti* on the other hand, "the dominant mosquito throughout September and October," whose larvae are often found together with those of *A. superpictus* and *A. elutus*, is, like *A. superpictus*, an important vector. So efficient has been post-War malaria control in the towns and hill villages of Palestine, that the former dominance of *A. bifurcatus* in that country has been much modified; it remains to be seen whether, as originally suggested by BUXTON, *A. elutus* will prove to be the chief vector of benign tertian malaria, with its peak in August, while *A. sergenti* is especially concerned in the conveyance of malignant malaria, the chief incidence of which occurs later on.

This paper, which includes useful notes on the distinctive larval characters, breeding places and seasonal occurrence in Palestine of the above-mentioned species, commences with a generous tribute to the pioneer work of others.

[Serious though the potential danger of malaria undoubtedly was to the Egyptian Expeditionary Force during the Palestine campaigns of 1917-18, the author's statement that the disease "ravaged and decimated the troops engaged on this front" is scarcely in accordance with facts, at least for the period before the general advance on September 19th, 1918. Whether or not as the result of very extensive anti-mosquito measures, "for the six months prior to October, 1918, the percentage incidence of malaria for the three Corps of which our front line was composed was just over five. To this, the sudden rise in the malarial rate within three weeks after the date of the general advance affords a sharp and significant contrast." (See AUSTEN, *Trans. Soc. Trop. Med. & Hyg.* 1919, November, Vol. 13, pp. 47-59).]

ii In spring, the sporadic appearance of *A. elutus* in hill villages 5 to 7½ miles south-west of Lake Huleh, in Upper Galilee, is due to the presence of small breeding places in the vicinity. At the beginning of summer these dry up completely, and the adult mosquitoes entirely disappear from the area. In autumn (November), as was first mentioned by KLIGLER (see this *Bulletin*, Vol. 26, p 6), before the winter rains set in or any new breeding places are formed, the hibernating generation of *A. elutus*, bred in the swamps of Lake Huleh and characterized by undeveloped ovaries and an abdominal cavity filled with fat-body, migrates *en masse* to a distance of some 8 miles (12½ km), which far exceeds the usual length of flight of the spring and summer generations. This migration, which proceeds from the breeding place in all directions, and is therefore not mere carriage by wind, causes the spread of malaria in areas at other times largely free from the disease.

E. E. A.

- i. MESNARD (J.) & TOUMANOFF (C.). Note préliminaire sur l'antropophilie de *A. minimus* Théo avec quelques remarques sur la zoophilie de *A. vagus* Don. en absence de stabulation parfaite du bétail. [On the Androphily of *A. minimus*, with Remarks on the Zoophily of *A. vagus* in Default of Complete Stalling of Stock.]—*Bull. Soc. Méd.-Chirurg. Indochine*. 1933. Nov.-Dec Vol. 11 No. 8 pp 994-1000 With 3 figs
- ii. TOUMANOFF (C.). Sur la fréquentation des habitations et des étables par les anophèles du Tonkin et la proportion des sexes dans les captures et les élevages. [The Frequenting of Dwellings and Cattle-Sheds by Tonking Anopheles, and the Proportion of the Sexes Caught and Bred.]—*Ibid.* pp. 1001-1017. [10 refs]

1. The application of the precipitin test to *A. minimus* from a highly malarious locality in Cochin China showed that 86.48 of the specimens were gorged with human blood; in no case had the insects been feeding on buffaloes or horses, although these animals were present. Thus results obtained by aid of precipitins tally with the presumption as to the food of the species in question derived from its maxillary index. *A. vagus* on the other hand, which is common in the Mekong delta, frequently battens on buffalo blood; and, since the local cattle-sheds are merely open shelters, there is no impediment to the attraction of stock for this species, as well as for *A. hyrcanus* var. *sinensis*. In a native village surrounded by such sheds, the huts merely form retreats for a species locally characterized by marked zoophily; and the institution of perfect stalling, as advised by ROUBAUD, would probably result in a complete severance of relations between *A. vagus* and man.

ii. The studies here described were initiated with the aim of discovering whether, in Tonking, the species of Anopheles found respectively in dwellings and in cattle-sheds are in accordance with the food-preferences of the insects; and whether there is agreement between such occurrence and capacity or otherwise to transmit malaria. Out of twelve species met with in the adult stage in each type of shelter, the commonest in human habitations were, in order of frequency, *A. vagus*, *A. minimus*, and *A. hyrcanus* var. *sinensis*; in cattle-sheds, although the same three species were the most numerous, the order was somewhat different, being *A. hyrcanus* var. *sinensis*, *A. vagus*, *A. minimus*. During the winter monsoon, i.e., at the time of its maximum abundance, the latter species is the principal one found in dwellings, while

during the summer monsoon it is relatively scarce in both types of shelter. Otherwise, apart from *A. hyrcanus* var. *sinensis*, the occurrence of species was not found to be in accordance with their transmitting power, and *A. jeyporiensis* and *A. aconitus*, both of which are recognized malarial vectors, were encountered in cattle-sheds as much as in human habitations. In studying predilection or the opposite for one or other type of shelter, it is necessary in each case to take account not only of the season, but also of other factors; and androphily or zoophily can be determined only by means of ROUBAUD's maxillary index (see this *Bulletin*, Vol. 30, p. 610), or by aid of the precipitin test (see above).

Females were found to predominate in both types of shelter; yet the scarcity of males revealed by captured specimens is merely apparent, and caution is necessary in estimating the proportion of the sexes. In adults reared from wild-caught larvae, and also from eggs laid in captivity, males and females were approximately equal in number, though the latter were very slightly in excess. E. E. A.

MORIN (H. G. S.) & BADER (H.). Sur quelques facteurs physico-chimiques de l'oecologie larvaire des anophèles au Tonkin. (Deuxième note.) [Physico-Chemical Factors in the Larval Ecology of Tonking Anopheles.]—*Ann. Inst. Pasteur* 1934. Mar. Vol. 52. No. 3. pp. 332-351. With 3 graphs & 1 fig.

The first part of this paper consists of records of experiments designed to show the amount of carbonic acid liberated by samples of different kinds of earth in Tonking, when treated with distilled water. From these experiments it is seen that organisms living either in water or on the surface of damp soil are in contact with proportions of carbonic acid gas, which vary greatly according to circumstances probably seasonal and perhaps even depending upon the particular year. Thus, if the authors' findings be confirmed, the effect of meteorological conditions upon living creatures would in many cases be explained by the natural production of carbonic acid gas owing to the action of water on the soil; and not only would the frequent connexion between rainfall or floods and the outbreak of epidemics become intelligible, but we might obtain useful information with regard to remedial measures.

Subsequently many pages are devoted to the hydraulics of the penetration of water through clay, in order to explain how it is that, in the Red River delta in Tonking, apparently stagnant pools are fed intermittently and seasonally by water, passing upwards from deeper levels through a homogeneous bed of clay, and thus come to be endowed with the usual characteristics of larval habitats of *A. minimus*. E. E. A.

- i. ROUBAUD (E.) & TREILLARD (M.). L'indice maxillaire chez *Pseudomyzomyia ludlowi* (var. *sundaica* et var. *litoralis*) en Indochine méridionale. [The Maxillary Index in *Anopheles ludlowi* vars. *sundaicus* and *litoralis*], in Southern Indo-China.]—*Bull. Soc. Path. Exot.* 1934. June 13. Vol. 27. No. 6 pp 552-554.
- ii. TREILLARD (M.). *Pseudomyzomyia ludlowi* en Indochine méridionale : variétés, biologie et pouvoir pathogène. [*A. ludlowi* in Southern Indo-China : its Varieties, Biology and Disease-carrying Powers.]—*Ibid.* pp. 554-559. With 2 figs.

i. No data are as yet available regarding the maxillary index of *A. ludlowi*, which plays a great part in the transmission of malaria in

Malaya, the Dutch East Indies, the Andaman Is., and on the south coast of Cambodia and Siam, and is one of the most important vectors of the disease throughout the Far East. In Southern Indo-China it occurs sporadically in the delta of Cochin China, and, in strictly androphilous and domestic conditions, in several localities on the shore of the Gulf of Siam, where it abounds in human habitations and shows a high percentage of infection.

The typical *A. ludlowi*, however, as also the variety *litoralis*, both of which are found in the Philippine Is., do not appear to be malaria carriers, while on the other hand the var. *sundaicus* [*A. sundaeus* of English writers] is a vector of importance. The two varieties mentioned occur in Indo-China, and *litoralis* is conspicuous among the scanty representatives of the species in regions, such as the delta of Cochin China, which are but slightly malarious. On the other hand in a malarious centre such as Réam in Western Cambodia the var. *sundaicus* predominates, and infected individuals belong to this form.

The mean maxillary indices of the vars. *sundaicus* and *litoralis* as exhibited by specimens from different localities on the coast of Cambodia and in the delta of Cochin China, are respectively 11.5 and 12.5, the maximum numbers of denticles observed being 12 (var. *sundaicus*) and 14 (var. *litoralis*), and the corresponding minima 10 and 11. Statistics are also given showing the proportion of maximal figures, the proportion of individuals having an index higher than 11.5; and the most frequent index. Although the two varieties examined do not exhibit marked differences in their maxillary dentition, *sundaicus*, the more pathogenic of the two, is the more nearly allied to the paucidentate group including *Anopheles minimus*, *A. aconitus* and *A. jeyporiensis*, the other important vectors in Indo-China, all of which have an index somewhere about 11.5.

Should subsequent study confirm these results, we shall have a fresh example of the parallelism existing between paucidentation and the domestic androphilism of the pathogenic species, showing within one and the same anopheline group a differentiation in respect of feeding preferences and therefore of pathogenic power.

ii Figures are given showing the wing markings in the group of species (*A. ludlowi* and its above-mentioned varieties *litoralis* and *sundaicus*; *A. paragensis*; *A. subpictus*; and *A. vagus*) resulting from the splitting up of what was formerly known as *Anopheles rossii*.

Individual longevity in *A. ludlowi* var. *sundaicus* is very pronounced. Whereas in the laboratory *A. vagus* seldom lives for 15 days, var. *sundaicus* in the same conditions may survive for 70, which suggests its ability to bite repeatedly.

A. ludlowi is especially abundant during the dry season in Southern Indo-China, whereas *A. vagus* reaches its peak during the rains. This periodicity is therefore not solely due to the production of breeding places in the wet season, but is largely connected with the hygrometric requirements of the adults.

While *A. minimus* owing to the nature of its breeding places is difficult to attack in the larval stage, measures against *A. ludlowi* var. *sundaicus*, which have proved so successful in the Andaman Is. and the Dutch East Indies, are facilitated, not only by the domestication of the adults, but by the localization of the larvae.

E. E. A.

RUSSELL (Paul F.) & SANTIAGO (Domingo) **Flight Range of the *Funestus-minimus* Subgroup of Anopheles in the Philippines. First Experiment with Stained Mosquitoes.**—*Amer. Jl Trop Med.* 1934 Mar. Vol 14 No 2 pp 139-157 With 2 figs & 1 map. [35 refs.]

The range of flight of the various malarial mosquitoes, though a matter of obvious practical importance, has in most cases not yet been definitely determined, and is still to some extent a matter of opinion, observers in the Argentine and in Java, however, working with stained anophelines, have recorded maximum distances of 6 kilometres ($3\frac{1}{2}$ miles) and 6.2 kilometres respectively. In the Philippines, the so-called *Anopheles funestus-minimus* subgroup, which is believed to include the chief local vectors of malaria, is composed of *A. filipinae*, *A. mangyanus* and *A. minimus* var. *flavirostris*, all of which breed in streams in the malarious foothills. In the experiment described 2,100 mosquitoes, "reared from larvae caught in typical *funestus-minimus* subgroup breeding places near Calauan," were "sprayed with a 2 per cent. aqueous solution of brilliant blue" (previously proved to be innocuous to the insects), and liberated two hours later. During the following twelve days, among a total of 10,946 mosquitoes caught at various points north and south of the place of release, 8 stained specimens were recovered; these included *A. minimus* var. *flavirostris* captured at 0.5 kilometre (550 yards); *A. mangyanus* at 0.9 kilometre, and *A. filipinae* at 1 kilometre from the spot where they were set free.

A further experiment, using larger numbers of mosquitoes, is to be undertaken. E. E. A.

ROUBAUD (E.) & COLAS-BELCOUR (J.). Observations sur la biologie de l'*Anopheles plumbeus*. III.—Le chevauchement des générations dans le cycle hivernal. [Biology of *A. plumbeus* III. The Overlapping of Generations in the Winter Cycle.]—*Bull. Soc. Path. Exot* 1934 June 13. Vol. 27 No. 6. pp. 546-551 With 1 fig.

As already shown (this *Bulletin*, Vol. 29, p. 835, and *ante*, p. 58), larvae from eggs deposited by *A. plumbeus* at the end of the season are destined to pass through the winter, and are subject to spontaneous developmental torpor (asthenobiosis), which is not dependent upon outside influences. Their development is from eight to ten times slower than that of the larvae of the spring generation. Torpid larvae, however, occur not only during autumn and winter; their appearance is due to senescence, both of actual generations according to the position of these in the annual series, and also of individual parents in a given generation, and in each case it is the result of fatigue. Thus larvae affected by asthenobiosis may appear in the first broods of the year, and they increase in number with the seasonal advance in the life-cycle of the species.

The author concludes from his observations that in *A. plumbeus* delayed larval development may in part be due to senescence of the mother, and may manifest itself in the first annual generation, members of which will consequently largely overlap those of the later broods of the year. Larvae from eggs deposited in July, by young females of the second post-hibernal generation, also included a proportion of individuals showing more or less retarded development; and in the case of one batch, which was kept at out-door temperature and passed through several periods of frost, the last pupa took 322 days to make its

appearance With few exceptions, retarded development in the progeny of the second generation manifested itself in the female sex. On the other hand, batches of eggs laid by females caught in the open in August and September always produced larvae all of which showed delayed development, passed through the winter, and developed into adults of both sexes.

Thus, as one annual brood succeeds another, the proportion of individuals showing retarded development increases, until at the end of the season it includes the entire progeny. At this time, though larvae affected by asthenobiosis and obliged to pass through the winter may belong to at least three generations, the maintenance of the species from one year to the next devolves almost entirely upon the third of these
E. E. A.

MEHTA (Dev Raj) **Ratio of Sexes of Some Indian Anophelines hatching under Controlled Conditions in the Laboratory.**—*Records of the Malaria Survey of India*. 1934. Mar. Vol. 4. No. 1. pp. 65-75. With 11 charts. [16 refs.]

Evidence in literature as to the proportion of the sexes in mosquitoes is conflicting; according to some writers males and females emerge from the pupa in more or less equal numbers, while others report marked predominance of one or other sex. In order to test these statements, especially with reference to the possible influence of different food conditions in the larval stage, the author (at Karnal, Punjab) made experiments with the three common Indian species, *Anopheles subpictus*, *A. annularis* and *A. culicifacies*, rearing the larvae in Petri dishes (1 inch by 6½ inches), each supplied with 200 cc. of distilled water, and feeding them either on dried and pulverised *Spirogyra*, pure yeast or crushed house-flies.

When different sized batches of larvae of *A. subpictus* were reared on *Spirogyra*, the sexes hatched out in approximately equal numbers, though in three out of four experiments females were in excess; the quantity of food supplied did not affect the sex-ratio, and neither sex appeared sooner than the other. Females (58 females to 36 males in one case, and 221 females to 188 males in the other) preponderated as the result of two experiments with larvae of *A. annularis*, powdered yeast being the food; in one case distilled water was replaced by water from a natural breeding place, containing fresh *Spirogyra* filaments. When newly hatched larvae of *A. subpictus* were fed on macerated flies, adults of both sexes subsequently emerged together "in almost equal numbers."

In order to check the foregoing results, large numbers of larvae of all three species mentioned, obtained in natural breeding places, were reared to the adult stage in the laboratory. Out of 3,325 *A. annularis* bred out in this way from March to June, 1933, 1,857 were males and 1,468 females, and emergences of the former sex were greatly in the majority during the first two months. Again, out of 1,807 bred specimens of *A. culicifacies*, the respective numbers of males and females were 947 and 860, and the preponderance of the former was especially noticeable at the beginning of the season. On the other hand in the case of *A. subpictus* the proportions of the sexes were reversed, and out of 3,007 bred adults 1,633 were females and only 1,374 males; the disparity was especially marked in the later emergences.

In the author's view, differentiation into sexes takes place in the ovum, so that "external factors during metamorphosis" can scarcely produce any inequality in this respect.
E. E. A.

SENEVET (G.) Contribution à l'étude des nymphes d'anophélins (4e mémoire) [**On Anopheline Pupae (4th Contribution).**].—*Arch. Inst. Pasteur d'Algérie*. 1934 Mar. Vol. 12 No. 1. pp. 29-76. With 13 figs.

The chief incentive to the production of this useful paper was furnished by the pupal skins of ten species, including one of *Chagasia* and nine of *Anopheles*, recently received from the Panama Canal Zone by the London School of Hygiene and Tropical Medicine, and handed over to the author for study. Descriptions and illustrations of these, and also of the pupal skin of the South African *Anopheles ardensis*, are followed by a statement of the general characters exhibited by the pupa in the various anopheline groups, supplemented by keys to genera, sub-genera, groups and species, likewise based on pupal characters. Comparison of a score of pupal skins of *Anopheles barbumbrosus* with the same number belonging to *A. barbrostris* failed to reveal any points of difference.

An alphabetical list of the species of anophelines of which the pupa has been described concludes what is certainly not the least valuable of the memoirs published by the Institut Pasteur d'Algérie. E. E. A

GALLIARD (H.) & SAUTET (J.) Note préliminaire sur les races d'*Anopheles maculipennis* de Corse. [**Preliminary Note on the Races of *Anopheles maculipennis* in Corsica.**].—*Bull. Soc. Path. Exot* 1934. Jan. 10 Vol. 27. No. 1 pp. 30-34.

In Corsica there are malarial belts in the coastal plain, and in the mountainous region tracts free from the disease. Results obtained by other workers elsewhere tend to show that the existence of malaria in western Europe is dependent upon the presence of the race or variety of *A. maculipennis* termed *atroparvus* or *labranchiae*, the larvae of which are said to live in brackish water. In Corsica, however, so far as may be judged from a study of 400 larvae from different points in the island, no such restriction as regards breeding place appears to occur. On the basis of larval and adult (hypopygial) characters, the great majority of Corsican specimens examined by the author belonged to the *labranchiae* (*atroparvus*) race. But, in addition to the long-winged race *messeae*, another (var. *maculipennis*?), intermediate in size and as regards the maxillary index, was also met with. E. E. A

- i. VAN THIEL (P. H.). Recherches sur la présence de l'*Anopheles maculipennis* var. *labranchiae* dans les Pays-Bas. [**Occurrence in the Netherlands of *A. maculipennis* var. *labranchiae*.**].—*Bull. Soc. Path. Exot*. 1934. Feb. 14. Vol. 27. No. 2. pp. 149-154.
- ii. —. Insuffisance des caractères de l'oeuf pour la distinction des races trophiques et biologiques de l'*Anopheles maculipennis*? [**Insufficiency of the Egg-Characters for the Distinction of the Trophic and Biologic Races of *A. maculipennis*?**].—*Ibid.* pp. 154-158.

i. Previous investigations by him in Italy convinced the author that *A. maculipennis* var. *labranchiae*, as found in central and southern Italy and Sardinia, while in the adult stage indistinguishable from the var. *atroparvus* of northern Italy, nevertheless shows a difference in the egg-floats, which are striated in *labranchiae* but transparent and smooth in *atroparvus*. The studies now described were undertaken in order to discover whether the persistence of malaria in certain parts of

the Netherlands is aided by the presence, among *A. maculipennis* var. *atroparvus*, of a sprinkling of the var. *labranchiae*, which is regarded as the more dangerous in southern Italy. For a number of years malaria has been fairly rife at Franeker, a small town in Friesland. But although, in houses and pigsties at this place, the author found *Anopheles* possibly belonging to the var. *labranchiae*, such insects cannot be of special importance in the epidemiology of malaria, since similar ones are almost equally common at two other Dutch localities, where malaria is much less frequent. Instead, therefore, of assigning these mosquitoes to var. *labranchiae*, van Thiel prefers to regard them as belonging to the short-winged *atroparvus* race, in which the striation of the egg-floats is much more variable than in *labranchiae*.

Since *Anopheles* containing nearly ripe eggs are rarely caught in houses, it is concluded that the females do not remain long indoors, and that therefore malaria is seldom transmitted from one member of a family to another.

11. This is by way of a reply to, or at least a commentary on a previous paper by ROUBAUD and GASCHEN (see this *Bulletin*, Vol. 30, p. 611) with the same title, minus the note of interrogation. It would be useful, says the author, to examine the structure of the egg-floats in the *messeae* type of *A. maculipennis* in different countries. He thinks that the southern European form of this race could be differentiated from the macropterous Dutch race, in the same manner and to the same extent as distinction between the varieties *labranchiae* and *atroparvus* is possible (see above). Since the presence of one race seems better able than that of another to produce anophelism without malaria, it may be that egg-characters are of greater value than has hitherto been believed. Details are given of a breeding experiment showing that, in Holland, the second generation of var. *atroparvus* can pass through the winter, and give rise to the spring brood of the following year. The findings of SWELLENGREBEL and his collaborators, and of ROUBAUD, on the subject of stenogamy and eurygamy are confirmed.

In a postscript, ROUBAUD confesses his inability to accept racial differences based on striation of the egg-floats, since, as admitted by van Thiel himself, all gradations are found between well marked striation and none at all. While denying that there is any reliable morphological difference between eggs of the *atroparvus* and *labranchiae* types, ROUBAUD reaffirms the validity, as distinctive characters between the two races, of definite biological differences, in addition to the fundamental criterion afforded by the maxillary index (see this *Bulletin*, loc. cit.). Egg-characters on the other hand enable us to distinguish with certainty between the two primary groups, *maculipennis-messeae* and *labranchiae-atroparvus*, although within each of these we find, according to locality, an infinite number of small differences, the value of which can be tested only by means of biological study. E. E. A.

EVANS (A. M.). On the Differentiation of *Anopheles maculipennis* in Great Britain, with Special Reference to a Form occurring on the Coast of North Wales.—*Ann. Trop. Med. & Parasit.* 1934 Mar. 29. Vol. 28. No. 1. pp. 131-140. With 2 figs. [34 refs.]

Ten years ago WRIGHT drew attention to differences between the hibernation habits of *A. maculipennis*, as observed by him in a coastal district of North Carnarvonshire, and the corresponding behaviour of the same species as recorded on the Continent. From observations on

the spot, and subsequent morphological study in the laboratory, Evans finds that WRIGHT'S *A. maculipennis*, while exhibiting certain differences, presents many points of similarity to the var *atroparvus*, which is nowadays considered to be responsible for the local persistence of malaria in parts of Holland and Northern Germany. Previous observations on the bionomics of *A. maculipennis* in various British localities are summarized, and attention is drawn to indications of racial differentiation.

[Although at present so attractive to continental malarialogists, the question of races or varieties of this species, in relation to the phenomenon of "anophelism without malaria," has not hitherto been the subject of definite research in England. The present contribution, inconclusive though it be, is therefore to be welcomed, especially should it, as is to be hoped, form an incentive to similar investigations in the formerly malarious, coastal districts of the eastern and south-eastern counties.] E. E. A.

ROUBAUD (E.). Etude du comportement sexuel comme caractère génétique chez l'*Anopheles maculipennis* (2e note) [Study of Sexual Behaviour as a Genetic Character in *Anopheles maculipennis* (Second Note).]—*Bull. Soc. Path. Exot.* 1934. Apr 11 Vol. 27. No. 4. pp 339-341. [3 refs]

In a previous paper on this subject by Roubaud, in collaboration with COLAS-BELCOUR and GASCHEN (see this *Bulletin*, Vol 30, pp. 305-306), it was shown that the eurygamous females of the macropterous Dutch race (*A. maculipennis* var. *messeae*) can be crossed with the stenogamous males of the var *atroparvus*; and that in the first mixed generation thus produced eurygamy proves to be a recessive character. The results of analogous experiments with the eurygamous var. *labranchiae* and the stenogamous var. *atroparvus* are now reported. The stock of the former variety, which is paucidentate, indifferently zoophilous, and breeds with great difficulty in a small space, was received from Spain (Murcia). In laboratory experiments carried on for two years in a cage one-twentieth of a cubic metre in size, several hundred females which were mated with their own males produced only two fertile batches of eggs. The *atroparvus* stock, on the other hand, obtained from the coastal marshes of Vendée, is definitely stenogamous, breeding freely in a cage of the dimensions stated. In June, 1933, in two cages (A and B) of this size, there were placed respectively 10 Murcian *labranchiae* females with fifteen Vendéean *atroparvus* males, and 10 Vendéean *atroparvus* females with fifteen Murcian *labranchiae* males. As a result, three batches of fertile eggs were deposited on 29th June and 6th July in cage B. By microscopical examination on the latter date, three out of six surviving females in cage A, and four out of seven in the other were found to have been fertilized.

From the fertile eggs in cage B adult males and females of the first cross generation were reared, but, in a cage measuring one-twentieth of a cubic metre, did not breed. It would seem then, although experiments are not yet complete, that, contrary to what occurs in the race *messeae* (*maculipennis typicus* of VAN THIEL), in the race *labranchiae*, after being crossed with *atroparvus*, eurygamy appears as a Mendelian dominant character.

Yet the most striking fact is that the sexes of the eurygamous *labranchiae* stock, which will not mate together in a confined space,

appear in the same conditions perfectly capable of fertilization when crossed with partners of a different race. The two races in question thus furnish a singular confirmation of the identical results obtained by DE BUCK, SCHOOTE and SWELLENGREBEL (this *Bulletin*, Vol 30, pp. 70-71) in their experiments in crossing the two Dutch races of *A. maculipennis*. CORRADETTI (1934), in regarding male *labranchiae* as alone incapable of breeding in a confined space, is in error. E. E. A.

CORRADETTI (Augusto). Ricerche sulla biologia delle diverse razze di *Anopheles maculipennis*. [Researches on the Biology of the Races of *A. maculipennis*.]—*Riv. di Malarologia* 1934. Vol. 13. No. 2. pp. 182-190. [12 refs.] English summary.

—. Sul comportamento sessuale dell'*Anopheles maculipennis* var. *labranchiae*—*Ibid.* pp 191-194 English summary (5 lines).

—. Ricerche sperimentali sui caratteri distintivi dell'*Anopheles elutus*.—*Ibid.* pp 195-200. [18 refs.] English summary (8 lines).

The author found that the duration of the larval stage of all the races (*labranchiae*, *typicus*, *messeae*, *atroparvus*, *elutus*) was 19-22 days at 23°C., and that *messeae* did not complete its development in 10 per mille salt water, whereas *labranchiae* and *atroparvus* did. Fertilization in captivity was obtained with *atroparvus*, and cross-fertilization with female *labranchiae* and male *atroparvus*, the eggs had the characters of *labranchiae* and larvae resulted. *Maculipennis* and *elutus* cannot be differentiated by the general colour of the body. A. G. B.

CHRISTOPHERS (Rickard) **Malaria from a Zoological Point of View.**—*Proc. Roy. Soc. Med.* 1934. June. Vol 27. No. 8. pp 991-1000 (Sect. Comparative Med. pp. 41-50). [22 refs]

It appears certain that distinct parasites occur respectively in the monkeys of the Oriental and the Ethiopian regions. *P. brasilianum* occurring in the Neotropical monkeys differs from any Old World form. None of the monkey parasites are really very close to those of man, but it is otherwise with those of the apes. The plasmodia of the gorilla and chimpanzee appear to be very similar to those of man, including the characteristic crescent forms. The parasites of human malaria do not show any apparent relationship to the usual zoogeographical realms. *P. vivax* occurs almost throughout the world within the July and January isotherms of 60°F. *P. falciparum* is limited by the isotherms of 70°F. *P. malariae* also probably has its distribution determined by factors other than those usually concerned in the distribution of animal forms of life. So far, *P. tenue* has been recorded from India only, and *P. ovale* from Africa. In a footnote, the author states that he twice injected a monkey (*S. rhesus*) with human blood containing *P. ovale*, but with negative results. This parasite resembles *P. knowlesi*, the monkey parasite. W. F.

ANNALS OF TROPICAL MEDICINE & PARASITOLOGY 1934 Mar 29 Vol 28. No 1. pp. 63-65—Malaria Research and the Malaria Commission of the League of Nations (From Dr E. J. PAMPANA, Acting Secretary to the Malaria Commission.)

- BARBOSA (Amando) Contribución al tratamiento del paludismo con la atebriña —*Medicina Países Cálidos* Madrid 1934 Feb, Mar & Apr Vol 7 Nos 2, 3 & 4 pp 73-81, 123-135, 157-173 [26 refs]
- BELLINCIONI (Giovanni) Studio sulle relazioni tra piogge e malaria —*Riv di Malarologia* 1934 Vol 13 No 2 pp 201-210 With 5 figs. French summary (7 lines)
- BEREGOFF (Pauline) The Schilling Differential Blood Count in Tropical Diseases A Study of 710 Cases with Special Reference to Malaria —*Jl Lab & Clin Med.* 1934 Mar Vol 19 No 6. pp 644-649 [10 refs]
- BRÁS DE SÁ (Luís José) Meios práticos de combater a malária em Gôa —*Arquivos da Escola Méd-Cirurg de Nova Goa* Ser B 1934 No 5 pp. 1212-1284 With 18 figs [53 refs]
- CHOPRA (R N) & WAHED (A K M Abdul). Toxic Effects produced by Combined Treatment with Atebrin and Plasmochin —*Indian Med Gaz* 1934 Apr. Vol 69 No 4 pp 213-214
- COOKE (W E) & McNAIR (James S). An Unusual Case of Hyperpyrexia in Malaria —*Brit Med Jl* 1934. May 5 p 801
- CORONGOTÓ (Visnudas Sinai) Um rápido inquérito a algumas aldeias do Concelho de Quepém com sugestões para o seu saneamento sob o ponto de vista da malária —*Arquivos da Escola Méd-Cirurg de Nova Goa*. Ser B 1934 No. 5. pp. 1285-1302
- DAVID (J.). Traitement du paludisme par l'atébrine —*Jl Egyptian Med Assoc* 1934 Feb. Vol. 17. No 2 pp 204-207 English summary
- DE LA CAMARA CAILHAU (Pedro) Normas para el ensayo de medicamentos anti-paludicos, con un ensayo de los preparados "710" y "574" Fourneau —*Medicina Países Cálidos* Madrid 1934 Mar, Apr & May Vol 7 Nos 3, 4 & 5 pp 97-113; 150-156, 208-241 With 5 graphs [78 refs]
- EJERCITO (Antonio). An Outline for a Malaria Survey —*Jl. Philippine Islands Med. Assoc.* 1934. Mar Vol 14 No 3. pp 102-107
- FRÓES (Hector P) Lições de clinica tropical (clinica medica regional) I Malaria, —pp lv + 318 With numerous figs., plates & graphs 1933. Bahia
- GUY (R). Note sur le paludisme à Chau-Doc —*Bull. Soc Méd-Chirurg Indo-chine* 1934 Feb Vol 12. No 2 pp 162-172 With 1 map
- HARVIER (P.), DE BRUN (R) & LAFITTE (A.) Paludisme après transfusion —*Bull et Mém Soc Méd Hôpít. de Paris* 1934 Mar. 19. 50th Year 3rd Ser. No. 9 pp 423-425
- JANTCHUR (N M) & BALKOVSKAYA (N.). [Transfusion of Preserved Blood from Malarial Cases] —*Milit-Med Ztschr* Leningrad 1933 Vol 4 No 5 pp 297-302 [In Russian] [See ACKERMAN & FILATOV, ante, p 459]
- JOHNSTONE (I. L.). Note on Malaria Epidemic in Honan, 1931 —*Chinese Med Jl.* 1934. Jan Vol 48 No. 1 pp. 56-58.
- MCQUEEN (W B.) The Place of Treatment in an Antimalarial Campaign —*Indian Med Gaz.* 1934 Apr Vol 69. No 4 pp 204-207 With 4 diagrams.
- MARTINI (E.). Betrachtungen ueber Immunität an der Hand neuerer Malaria-forschungen —*Med Klin.* 1934. July 13. Vol 30. No 28 (1543). pp. 939-940.
- MONNEROT-DUMAINE (M.). Goutte ou paludisme? —*Rev Méd et Hyg Trop.* 1934. Mar.-Apr. Vol 26. No 2. pp. 92-95.
- OTTOLENGHI (Donato) La profilassi della malaria e, in particolare, la profilassi medicamentosa —Reprinted from *Giorn. di Med. Milit.* 1934. Apr No 4. 8 pp.
- OTTOLENGHI (D.) & ROSA (A.). Ricerche sulle razze di *Anopheles maculipennis* del Ferrarese e di alcune zone limitrofe —Reprinted from *Bull. d. Scienze Mediche.* 1933. Vol 105 No 6 15 pp. With 5 figs. [15 refs.]
- PETER (F M.). Bijdrage tot de kennis van de epidemiologie van de malaria in Suriname en Nederlandsch Guyana. —Reprinted from *Geneesk. Gids* 1934 Apr. 20. Vol 12e No 16 pp 370-374.
- PETIGARA (P M.). Antimalarial Measures in India and Abroad —*Bombay Med. Jl.* 1934. Mar. Vol. 3. No 3. pp. 70-72.

- PINARD (Marcel) A propos de la syphilis et du paludisme après transfusion — *Bull et Mém Soc Méd Hôpiti de Paris* 1934 Mar 19 50th Year 3rd Ser No 9 pp 416-417
- PONTES (José de Paula Lopes) Forma suprarrenal do impaludismo. "Syndrome de Fraga" — *Brasil-Médico* 1934 Apr 28 Vol 48 No 17 pp 296-300 [14 refs]
- PONTES (J P Lopes) Forme surrénale du paludisme. Syndrome de Fraga — *Rev Sud-Américaine de Méd et de Chirurg* Paris 1934. Mar. Vol 5. No 3 pp 145-156 [14 refs]
- SAMPEDRO (M Maldonado) La lucha antipalúdica en la sociedad de Peñarroya (1928-1932) — *Medicina Paises Cálidos* Madrid 1934 June. Vol 7 No 6 pp 275-290 With 3 figs & 1 chart.
- SCHWETZ (J) Moustiques capturés et moustiques élevés — *Ann Soc Belge de Méd Trop* 1933 Dec 31 Vol 13 No 4 pp 429-434
- SCHWETZ (J) Sur le paludisme des pygmées — *C R Soc Biol.* 1934. Vol. 115 No 11 pp 1228-1230
- SENEVET (G) & COLLIGNON (E). Nouveaux gîtes à anophélines en Algérie — *Arch Inst Pasteur d'Algérie.* 1934 Mar. Vol. 12 No 1 pp. 22-25.
- SHLENOVA (M F.) Die herbstliche Veränderung des physiologischen Zustandes von *Anopheles maculipennis* in Karatal [Autumn Alterations in the Physiological Condition of the Females of *A. maculipennis* in Karatal (Semirech'e)] — *Med. Parasit & Parasitic Dis.* Moscow 1933 Vol 2 No 6. [In Russian pp 389-396. German summary pp. 396-397]
- TIROUVANZIAM & PHLENG Le paludisme à Kratié — *Bull Soc Méd-Chirurg Indochine.* 1933 Nov-Dec. Vol 11. No. 8. pp 930-935
- TRAN-VAN-DON. Notes sur le paludisme contracté par les pèlerins à la grotte de Nui Bà-den à Tây-ninh (Cochinchine) — *Bull Soc Méd-Chirurg Indochine* 1933. Nov.-Dec. Vol. 11. No. 8 pp. 936-948.
- WALLACE (R. B) Mass Treatment with Atebrin and Plasmochin Simplex, 1933 — *Malayan Med Jl.* 1934. Mar. Vol. 9 No 1. pp 33-37. With 4 charts.
- WRIGHT (Robert E) Quinine versus Atebrin and Plasmoquine. [Correspondence] — *Brit Med. Jl* 1934. May 12 p 869
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MISCELLANEOUS

FEDERATED MALAY STATES Annual Report of the Institute for Medical Research for the Year 1932 [KINGSBURY (A. Neave), Director.]—108 pp 1933 Kuala Lumpur Govt Press

The chief items of interest in this report concern research in malaria and tropical typhus, and a case of human trypanosomiasis due to infection with *T. lewisi*.

Malaria—Several experiments were made with quinoplasmoquine in the prophylaxis of malaria, and, as usual, the results depended upon the thoroughness of the supervision and discipline which could be exercised in the administration of the drug, for example, it was found in a group giving unsatisfactory results that only one person in every four was taking the tablets which had been provided. The administration of two tablets three times a week and one on Saturdays, for a period of nine months, reduced the parasite rate of the labourers on a rubber estate from 11.4 to 4.7 per cent., but it was found impracticable to treat the children under 3 years of age, and the cost was at the annual rate of \$11.00 (£1 5s. 8d.) per coolie. A tablet of quinoplasmoquine contains $4\frac{1}{2}$ grains of quinine and 0.01 gram plasmoquine.

Dr. Richard GREEN made several comparative tests of atebirin and quinine in the treatment of malaria. He treated 125 cases in hospital with atebirin, and a second series of 125 with quinine. The majority of these patients were kept under observation for several weeks or months, and while the relapse rate in the quinine group was 35 per cent, the rate in the atebirin group was only 2 per cent. He also made comparative tests of the value of these drugs in the prophylaxis and treatment of malaria on rubber estates; here again the advantage was with atebirin and it cost less than the quinine used in the control group.

Dr. J. W. FIELD made a clinical trial of totaquina, Type 2, at the District Hospital in Kuala Lumpur. A first series was given 20 grains daily, and a second series, 2 grams per 100 lbs. of body weight (0.044 grams per kilo.) which is equal to 30 grains a day for a man weighing 7 stone 2 lbs. Equal numbers of controls were treated with quinine in the same doses. Thick blood films were examined daily, and parasite counts were made by Sinton's fowl corpuscle method. This work is still in progress, but from the results so far obtained it appears that there are no significant differences between totaquina and quinine either as regards therapeutic efficiency or toxicity, though parasites tend to disappear rather earlier with quinine.

Dr. Field also tested the efficacy of blood culture in the diagnosis in malaria, as recommended by KNOWLES. He concluded that it had no advantage over the ordinary thick film method of examination in benign tertian and quartan malaria, but, in subtertian, the recognition of parasites became easier after 24 hours' incubation, because the rings had grown to the pigmented schizont stage: later on, the number of parasites was reduced by phagocytosis. THOMSON's clumping was seen in many cases. It was limited to well grown schizonts, and was not a constant feature, for example, it was absent in a comatose case of cerebral malaria. Mayer's reagent does not always precipitate quinine from a urine which is alkaline, and Dr. Field therefore prefers Tanret's reagent which contains acetic acid. [*Ante*, p. 431.]

Dr. Richard GREEN and Mr. E. P. HODGKIN, the Entomologist, dissected a large number of anopheles caught in traps. Nineteen *A.*

maculatus were found with oocysts and 45 with sporozoites; no infections, beyond a solitary gut infection in *A. karwari*, were found in other mosquitoes, though some of them—especially *A. karwari*—were more readily infected in the laboratory than *A. maculatus* itself. This apparent anomaly was explained by the results of precipitin tests carried out on mosquitoes, which showed that *A. karwari* and the other anopheles preferred to feed on animals and therefore did not carry malaria like the man-biting *A. maculatus*. A number of experiments was carried out with different samples of antimalaria oils and a mixture of 42 parts of heavy oil No. 2 with 22 parts of solar oil No. 3 appeared to be the most effective.

Tropical Typhus—Dr R. LEWTHWAITE and Dr. S R SAVOOR continued their work on the typhus fevers. [It will be remembered that there are three of these diseases in Malaya. (1) The urban or "W" form of tropical typhus, also known as "shop" typhus; in which *Proteus* X 19 is agglutinated. (2) The rural or "K" form, also known as "scrub" typhus, in which *Proteus* XK is agglutinated. (3) tsutsugamushi disease, or Japanese river fever, which occurs in the same places as scrub typhus, and in which, also, *Proteus* XK is agglutinated.] Shop typhus was readily established in guineapigs by the inoculation of the blood of a patient, and the strain (Manikam) is now in its 17th passage. Scrotal swelling usually occurs in guineapigs inoculated intraperitoneally with this strain and Rickettsia is present in the exudate. When the virus is inoculated into rabbits, it produces X19 agglutinins. The establishment of a strain of scrub typhus was a different matter, and it was only after numerous unsuccessful attempts that eventually a strain (Seerangayee) was established by the inoculation of a patient's blood into guineapigs which had been fed on a diet deficient in vitamins; this strain is now in its 34th passage. Scrotal swelling does not occur in guineapigs inoculated with this strain but Rickettsia is found in the scanty exudate over the spleen and testes. Inoculation of the virus into rabbits produces XK agglutinins. The virus of the tsutsugamushi disease is, like that of scrub typhus, difficult to establish in guineapigs and all attempts have been unsuccessful. The immunity reactions of the viruses of shop typhus and scrub typhus have been investigated. Each produces a solid immunity in guineapigs, but a guineapig which had been rendered immune to shop typhus is not immune to scrub typhus, nor is one which has been rendered immune to scrub typhus made immune to shop typhus. In short, there is no cross immunity between shop typhus and scrub typhus.

NAGAYO has described a characteristic inflammatory reaction which follows the inoculation of the virus of the tsutsugamushi disease of Japan into the anterior chamber of rabbits' eyes. LEWTHWAITE and SAVOOR have used this method in the investigation of the Malayan diseases. Strains of the scrub form of tropical typhus and a strain of tsutsugamushi were readily established in rabbits and were passaged by the inoculation of aqueous humour. The reactions were the same as those described by NAGAYO, and Rickettsia resembling his *Rickettsia orientalis* was constantly present on Descemet's membrane. The infection following the inoculation of virus into the eye is not merely local, for the rabbit subsequently gives a positive Weil-Felix reaction and the eye on the opposite side becomes immune to inoculation with the virus. The virus of shop typhus, the urban form of tropical typhus, which is easy to establish in guineapigs, could not be established in rabbits' eyes; in one instance a strain was carried on for three

generations, and the animals through which it had passed were used for cross immunity tests. These tests showed once more that there was no cross immunity between shop typhus and scrub typhus.

Tests were also made with the strains of tsutsugamushi and shop typhus which had been established in rabbits' eyes, the results showed that there was cross immunity between them. The only differences between the two diseases are, the characteristic eschar and attendant bubo in the tsutsugamushi disease and also the longer fever and graver prognosis.

Several strains of virus were obtained from the brains of rats caught in places where cases of tropical typhus had occurred. These strains produced a positive Weil-Felix reaction when inoculated into rabbits, sometimes in high dilutions of over 1/1,500. They also produced a scrotal swelling with *Rickettsia* in the exudate when inoculated into guineapigs, but cross immunity tests appear to show that they are not identical with the human strains which have been established in animals.

There have been 623 cases of tropical typhus during the last four years; 502 were rural or scrub typhus and 121 urban or shop typhus. The tsutsugamushi disease is comparatively rare: only 20 cases have been recognized in 6 years. Scrub typhus occurs in endemic form on three oil-palm estates in the Peninsula. Both living emulsions and alcoholic suspensions were used for the Weil-Felix reaction, and it was found that the readings with the living organisms were about 25 per cent. higher than with the killed suspensions. A locally isolated strain of XK was employed in many cases. [See Annual Report for 1931. This *Bulletin*, 1933, Vol. 30, p. 637.]

Enteric Fevers.—One hundred and eighteen cases of enteric fever were diagnosed bacteriologically or serologically. An analysis of 668 cases during the last 4 years gave the following percentages: 87.9 *Bact. typhosum*, 7.8 *Bact. paratyphosum A.*, 2.7 *Bact. paratyphosum B* and 1.6 *Bact. paratyphosum C*. The blood clot from specimens sent for the Widal test was cultured in bile medium, with the result that enteric organisms were grown in 59 cases out of 288 where the Widal reaction was positive and in 5 cases where it was negative.

Vaccine Lymph.—The rabbit-calf-buffalo cycle for vaccine lymph production was continued during the year, in 1,380 insertions made with lymph fresh from the refrigerator there were only 0.6 per cent. of failures, and, after keeping for 7 days at tropical room temperature, only 3.7 per cent. of failures. The potency of some of the batches of lymph stored at -23°C . (*sic*) was reduced by 50 per cent. in 18 months. Native mothers sometimes apply lime juice to the scarifications in order to prevent a "take," and it was found experimentally that this preventive was effective in 50 per cent. of cases, even if applied half an hour after vaccination.

Pasteur Treatment.—Antirabies vaccine was prepared as a 2 per cent. emulsion of sheep's brain, instead of a 1 per cent. emulsion of rabbit's brain. It was issued to various centres, and 103 persons received treatment. There were 3 deaths from hydrophobia; one was a child who was treated from the second day, the second case was treated late and irregularly, the third case received no treatment. Ordinary cases received two inoculations of 2.5 cc. daily for 14 days; when the bites were severe the treatment was continued for 21 days. There were no paralytic accidents. The mass inoculation of dogs was carried out during the early part of the year.

Division of Chemistry—A large number of water samples and milk samples were examined in the Division of Chemistry, under Mr. R. W. BLAIR. Eleven cases of datura poisoning were among the toxicological examinations, this drug is used by thieves to stupefy their victims. Thirteen samples of face powder, out of 20 examined, were found to contain lead. The sale of cosmetics containing lead is now forbidden by law. Other investigations included the examination of sewage effluents, drug samples, coins, spurious currency notes, etc. There was a considerable increase in the number of biochemical examinations. A course of lectures on scientific criminal investigation was given to police officers. The preparation of vitamin B extract by adsorption on to acid clay, according to the technique of JANSEN and DONATH was continued. The dose of this powdered extract is 2.5 grams daily for prophylaxis and 5 for treatment.

Miscellaneous Investigations—A unique and most interesting discovery was a case of human trypanosomiasis in a Sikh baby, which was due to infection with *T. lewisi*. The baby recovered without specific treatment, after a fever which lasted for several weeks.

An unsuccessful attempt was made to transmit leprosy by the inoculation of triturated nodules from human cases into rats which had been fed on a diet deficient in vitamins.

Other investigations included the typing of pneumococci, diphtheria (which is on the increase), skin diseases such as Singapore foot, and an eczematous condition which attacks labourers who work machines employed in making rubber crepe; it appears to be due to the acids which are used to coagulate the latex. There was also a host of routine examinations, such as precipitin reactions in connexion with medico-legal work, the bacteriological examination of milk and water, etc. Only one case of human melioidosis was diagnosed during the year, but the number of *post mortem* examinations, 219, was not large.

W. Fletcher.

BRITISH EAST AFRICAN TERRITORIES, CONFERENCE OF GOVERNORS OF :
Research Conferences. Conference on Co-ordination of General Medical Research in East African Territories. Held at Entebbe, 27th to 29th November, 1933.—35 pp. 1934. Nairobi: Govt. Printer.

This Conference was held at Entebbe in November, 1933 and was attended by 16 medical officers and specialists, 6 (including the Chairman, Dr. KAUNTZE) from Uganda, 5 from Kenya, 2 from Tanganyika, 1 from Nyasaland (Entomologist) and 1 from Zanzibar (Pathologist); Dr. LUC FONTANA attended from Belgian Congo. The Report contains much that is of interest.

Centralization of the manufacture of vaccines and other biological and pharmaceutical products in the East African territories was discussed; the principle was approved but it was agreed that further centralization was at present impracticable. The importance of the standardization of medical records, especially vital statistics, and of the correlation of clinical and pathological records in every possible case, and the need for complete autopsies were emphasized.

With regard to meat and milk the Conference considered :—

"It would be of great advantage if these articles played a greater part in the dietaries of native peoples and held the view that this matter was chiefly a question of distribution as regards meat and of the introduction

of mixed farming as regards milk. they desired to invite the attention of the Governors' Conference to the great importance to public health of research into the administrative problems involved "

They drew attention to the great value of propaganda, such as health weeks, baby weeks, cinema films, lectures and pamphlets.

Under the head of Rural Sanitation they directed attention to the five following subjects —

- " (1) the improvement of the economic conditions of the people ,
- " (2) education in hygiene ,
- " (3) the provision and improvement of water supplies both for domestic and agricultural purposes ,
- " (4) the improvement of housing conditions ,
- " (5) the conservation and disposal of manure,

and held the view that all of these matters are interdependent and progress with regard to any one is unlikely to be considerable unless attention can be directed to each of the others in the same area as far as possible at the same time "

They stressed the need of effective agricultural teaching and of the provision of trained sanitary inspectors in rural areas. They considered that research directed to the best means of providing and improving domestic water supplies would yield results of great sanitary and economic importance. In regard to the conservation and disposal of manure they " considered that ill-health in Africa is to no small extent a matter of poverty, poor nutrition and fly-borne diseases such as yaws, ulcers, the dysenteries and so on "

The agreement on research into disease and general problems is summed up in the medical research program, part of which is to be carried out in all territories and part in one or more of the 8 laboratories or institutions.

Investigations to be carried out in all territories :

Yaws and Syphilis.—Exchange of sera to ensure comparability of sensitivity of Kahn test

Anaemia, primary and secondary ; Blood Counts in Africans ; Composition of Normal Blood in Africans.

Dysentery.—Bacteriology. Interchange of cultures of local strains of dysentery group bacilli.

Malignant Disease.—Collection of statistics by all medical officers

Salmonella Group Infections.—Interchange of cultures of local strains of typhoid group bacilli.

Tropical Ulcer.—To be investigated wherever material available.

Yellow Fever.—Systematic examination of populations for immunity to yellow fever.

Bacteriology of Water Supplies.—Bacteriologists of territories to confer on program of research to be carried out as and when possible.

Precipitin Tests in Medico-Legal Work.—Bacteriologists of territories to confer on standardisation of technique of precipitin test.

To be carried out at one or more laboratories :

Nutritional and Metabolic Problems.—Basal metabolism of African

Malaria.—Precipitin tests of food supply of mosquito. Factors concerned in rendering certain waters favourable for breeding of anopheles ; Testing anti-malarial oils : Fish for control of larval breeding.

Plague.—Bacteriology : Rodent as reservoir and entomological aspect

Tuberculosis (human and bovine).

Abortus Fever and Contagious Abortion.

Dysentery.—Investigation of breeding places of house flies.

Helminthiasis. [Search in collaboration with Medical Research Council, for effective and cheap anthelmintics.]

Pneumonia—Typing strains of pneumococci and interchange of cultures and type sera

Rabies

Tropical Typhus

Analysis of Locally Grown Food-Stuffs

A G B.

LAMBERT (S M.). **Health Survey of British Solomon Islands Protectorate 1933.**—21 pp 1934. Suva, Fiji: Govt. Printer.

The author has had an opportunity of visiting a number of inaccessible and unsophisticated islands. He records anthropological observations, and facts about the prevalent diseases.

Dr Lambert has had an unusual opportunity of visiting some remote and particularly interesting islands in the Western Pacific. With the aid of a sympathetic millionaire and a private yacht, he has been to a number of places which are almost inaccessible to the ordinary traveller. In the course of the journey the party visited Tikopia, Sikaiana, the Duff Group, Anudha, Vanikoro, and several other small islands of great interest. Dr. Lambert was also able to pay a second visit to Rennell and Bellona.

A considerable part of this valuable report contains anthropological observations. The author is now better able to understand the religious system of the people of Rennell, and corrects several of the impressions which he received at his first visit. He devotes attention to the effect of Europeans on these small and unsophisticated communities, and he gives several examples in which the results of missionaries' activities seem to be unfortunate.

Medical investigations were also carried out. The author made a practice of counting the population by house-to-house visit, and he records the numbers and the proportion of sexes in adults and children. In one or two cases he gives also a record of births extending back for several years. Tuberculin tests were carried out, and it is interesting to note that the proportion of positives is materially lower among the almost untouched people of Rennell than elsewhere: but even on Rennell 60 per cent. of adults and 25 per cent. of children gave a positive reaction. Attention was also given to clinical evidence of tuberculosis, and to yaws and malaria, also to the state of the teeth. Members of the party collected mosquitoes on all the islands which were visited, and have added to our knowledge of the distribution of these insects.

P. A. Buxton.

INDIA. **Annual Report of the Public Health Commissioner with the Government of India for 1932.** Vol. II.—pp. iv+195. 1934. Delhi: Manager of Publications. [Re. 1-10 or 2s. 9d.]

This volume deals as usual with the health of the British and Indian armies in India. Malaria continues to hold pride of place as the scourge of the army in India and, as would be expected, the space allotted to the disease in this publication is proportionate to its importance. Although the year under review had the lowest malaria figures on record, the admissions for that disease formed nearly 15 per cent. of the whole. The report points out that the authorities well know how to deal with the malaria problem but the funds necessary to put this knowledge into adequate use are not available. The total sum allowed for anti-malaria field work for the year represented an expenditure per head of the military population of 10d., whereas in the last year for which figures are available, the expenditure on such field work in the Panama

Canal zone amounted to almost £1 16s per head. The section dealing with malaria therapeutics is particularly interesting. It is claimed that a daily dosage of plasmoquine gm 0.03 plus quinine grains 20 continued for three weeks has reduced the relapse rate in benign tertian malaria to under 5 per cent. The promised report on the curative effects of plasmoquine and atebirin in comparison with that of the combination just mentioned will be awaited with interest. Plasmoquine as a prophylactic was tested on a large scale during military operations in Burma, over 5,000 officers and men being the subject of the experiment. The results are described as moderately good, and it is considered that the daily dose employed, gm 0.02, even if it did not prevent infection, exercised a powerful delay action without interfering in any way with the subjects' physical activities and general well-being. An effect that might be of outstanding importance in military operations.

Of the major tropical diseases, dysentery comes next in importance to malaria as measured by hospital admissions. During the past five years there has been an enormous expenditure of labour in searching for dysentery carriers among menials who are employed in handling food. In the year under review, 43 men infected with dysentery bacilli, and 388 who were passing *E. histolytica* cysts, were detected, the result of some 80,000 examinations—a poor halfpennyworth of bread to an intolerable deal of sack. Through these labours, however, some points of practical value have emerged. There is no record of the discovery of a symptomless carrier of dysentery bacilli, all positive results having been obtained in persons suffering from dysentery, either primary or relapsing. In order to escape the disabilities following detection, men have been encouraged by the present system of examination to conceal their disease whenever possible, and to remain at work during the only period when they are definitely infective. It is now proposed to adopt measures which will induce such dangerous persons to report sick so that they may be dealt with suitably. As regards amoebic dysentery, there is a striking lack of correlation between the number of persons passing cysts and the number of cases of amoebic dysentery. The wide variations in the percentage of carriers detected in different districts and at different times are not reflected in the incidence of the disease which pursues a steady course uninfluenced by alterations in this supposed reservoir of infection. Further, careful records have been kept of the incidence, by units, of amoebic dysentery, but at no time has the distribution suggested infection from a carrier; on the contrary, it remains roughly proportionate to the numbers at risk. In view of these facts it has been decided to abandon the routine examinations originally adopted in the hope of excluding cyst-passers from duties involving handling of food.

This publication is of great value for it deals with the largest population in the Empire which is under continual medical observation and control, and where the after-results of medical treatment and of health measures generally can be determined to an extent impossible elsewhere.

W. P. MacArthur.

NÄGELSBACH (E.). Ärztliche Erfahrungen im Hochland von Abessinien. [A Physician's Experiences in the Highlands of Abyssinia.] *Arch. f. Schiffs- u. Trop.-Hyg.* 1934. Mar. & Apr. Vol. 38. Nos. 3 & 4. pp. 100-112; 147-155. With 1 fig. [14 refs.]

The author spent six years in Abyssinia, first in the Gore district at a level of 1,500-2,000 metres and then at Addis Ababa at 2,500 metres.

Autopsies are not permitted and bacteriological examinations were not possible. He gives a general account of his experience.

Enteric fevers are clinically common but positive agglutination with *Bact typhosum* was unusual. Dysentery, both amoebic and bacillary, occurs but there is no record of liver abscess. Typhus is common, and lice infestation general; in two instances the author got a positive Weil-Felix reaction. Relapsing fever is very common [see this *Bulletin*, Vol. 26, p. 114]. It is not conveyed by ticks in the highlands for there are none; lice are here the vectors.

The highlands of Gore are also free from malaria and anopheles, except for cases in natives who come up from the lower levels, but at Addis Ababa malaria is found, e.g., in 1929 in ten Abyssinians who had never left the capital, the author suggests that the vectors do not leave the houses at night. Lobar pneumonia is prevalent and very fatal. There is no plague, and no cholera recently. Tuberculosis of lungs, lymphatic glands, joints and skin is about as frequent as in mid-Europe, but the first-named takes a more rapid and severe course. He has reported on leprosy in another paper [*loc. cit.* Vol. 24, p. 551]. Leishmaniasis has not been seen in either of its forms.

He doubts the presence of undulant fever though that diagnosis is sometimes made, and objects that the Abyssinians do not drink goat's milk. Of eye diseases conjunctivitis, trachoma and iridocyclitis of unknown causation are common. He has reported on syphilis [see *Bull of Hyg.* Vol. 1, p. 867]. He calls it exotic syphilis and says that it stands midway between old world syphilis and tropical yaws, the congenital disease is not seen. Mosquitoes are not seen in the Gore highlands. Phlebotomus, however, are troublesome in the dry season and are probably responsible for the short term fever which is then prevalent. The chigoe flea was reported by LAMBIE in 1920 as absent, in 1924 when the author arrived it was established; hence it must have reached Abyssinia between those dates. A skin affection which is contracted after passing through long grass in a particular region is probably due to a mite. Every Abyssinian has a tape worm, in fact since it takes 2 months for *T. saginata* to become mature he has 6 a year. No feast is held without raw beef. The above is a short account, those who wish for more information must read the paper.

A. G. B.

CONGO BELGE. Fonds Reme Elisabeth pour l'Assistance Médicale aux Indigènes du Congo Belge (Foreami). Rapport annuel 1932. [The Activities of Foreami in Belgian Congo in 1932.]—51 pp. With 2 folding maps. Bruxelles: 9a Rue des Petits-Carmes.

In 1932 the foundation known from its initial letters as FOREAMI [this *Bulletin*, ante p. 326] was active in the district of Bas-Congo and in a part of the mandated territory of Ruandi-Urundi, namely Tanganika-Ruzizi. Whereas in the first all endemic and epidemic diseases were combated, in the mandated territory the foundation has concentrated on sleeping sickness. The success achieved is attributed to careful enumeration but by hut of the population, treatment, with adequate record, of all the sufferers from diseases which it has been decided to combat, use of European personnel to carry out or supervise

the above-named objects and permanence of such personnel, unity of direction and continuity of work, assistance of administrative officers and of religious missions.

Report of the Sector of Bas-Congo (Dr. DUPUY, Director) —

The personnel consisted of the Director, 13 doctors, 16 sanitary agents, a secretary and a clerk and a large number of native assistants, including 173 infirmiers. The number of effectives is related, amongst other things, to the existence or creation of roads traversable by motor cycle and this is considered so important that the foundation allots a credit to the natives for the making of such roads. Dispensaries to the number of 101 have been constructed, with houses for the native personnel. The enumeration of natives reached 579,303 and 531,798 were medically examined. Rather more than half the population were treated at the dispensaries and 21,206 in hospital. An account is given of the epidemic and endemic diseases met with. Of sleeping sickness 2,324 cases were diagnosed. Over 10,000 patients were under treatment. It is interesting to read that lumbar puncture is demanded by the patients themselves. Of yaws 10,851 cases have been treated against 23,467 in 1931, this is regarded as a real decrease. In the course of 3 enumerations 900 lepers have been recognized. They are treated in villages of segregation attached to missions. The auxiliary service of Medical Assistance to Natives, designated SADAMI, treated in the year 129,210 new cases. Many details of their activities are given. Other data concern infant and maternal welfare, hygiene of villages, vital statistics.

Report of Dr. PRATI, Director of the Sleeping Sickness Mission, Tanganyika-Ruzizi —

The personnel consists of the Director and three sanitary agents. The number of persons examined in the year was 58,693, and of these 1,054 were found infected, or 2.5 per cent. The percentage gets less as one travels south, being 6 per cent. in Ruzizi-Nord, and 1.5 per cent. in Nyanza-Lac which marches with Tanganyika Territory. Of the 2,499 patients treated 49 per cent. were apparently cured and 11 per cent. died. The author discusses the difficulties of combating sleeping sickness in this region. One particular difficulty is in Bigarama in the north, where natives who live in the hills come to work in the infected plain and escape examination on their return. His proposals include suppression of these movements.

A. G. B

BURTON (A. W.). **Common Disorders among Adult Male Xosas and Fingoes in the Border Districts.**—*South African Med. Jl.* 1934. May 12. Vol. 8. No. 9. pp. 327-337. With 8 figs.

The author, who is a Medical Officer to the Native Recruiting Corporation Ltd., Kingwilliamstown, in the last 13 years has examined 33,308 male natives between 18 and 45 years for work on the Transvaal mines and has kept careful records. He notes that they were men who considered themselves fit for work, which accounted for the low percentage of some disorders, and that the standard of muscular development was high. The table gives the results (records of 3 and less are omitted).

Statistical Record

Total Number of Recruits Examined, 33,308 Number rejected, 5,592
(16.5 per cent)

Classification of Causes of Rejection

(With the number rejected for each disorder and percentage of the total number examined)

<i>Respiratory Disorders</i>				Rejected	Percentage
Poor expansion	..	...		264	0.80
Silicosis	..	..		21	0.06
Tuberculosis	.	..	...	254	0.70
Pleurisy	.	...	..	18	0.05
Chronic bronchitis with emphysema				166	0.50
Asthma	.	.	.	7	0.02
Influenza	.	..	..	76	0.20
Ozaena	..	..	..	6	0.18
				<hr/> 812	<hr/> 2.51
Poor physique	...	..	..	2,833	8.5
Under age	..	.	..	924	2.8
Over age	...	.	...	91	0.2
<i>Cardio-Vascular Disorders</i>					
Valvular disease of heart	...	...		190	0.60
Hypertrophy and dilatation	...	.		13	0.04
Varicose veins (marked)	..	..		19	0.06
				<hr/> 222	<hr/> 0.70
Adherent scars on legs	...	..		22	0.06
Old injuries	...	...	...	197	0.6
Defective vision	...	...	.	143	0.5
Venereal diseases	...	...	...	44	0.15
Ear diseases	...	...	.	28	0.09
Skin diseases, sores and ulcers	...	...	...	107	0.3
Enlarged glands	...	...	...	102	0.3
Spinal defects	...	...	...	6	0.018
Osteomyelitis	...	..	...	7	0.02

Hernia statistics

Among the 33,308, there were —

Inguinal (oblique)	..	..	.	11	0.03
					(all rejected)
Umbilical	...	..	...	1,065	3.2

(Only nine rejected on account of large size and progressive nature)

The silicosis cases had been diagnosed by radiography. [Was this contracted in previous service at the mines?] The tuberculosis figure he remarks is low. In his private practice among 3,000 patients he found tuberculosis (mainly pulmonary) to cover about 9 per cent. In reference to the heading "poor physique" he considers the percentage of physically unfit among natives to be about 10 per cent. and contrasts this with the rejection for the army in Great Britain of over 50 per cent. Of the cases of valvular disease all had the physical signs of mitral disease; neither aortic diseases nor aneurysm were met with. Of the defective vision rejects many had extensive leucomata due to corneal ulceration. Of the ear cases all were chronic suppurative otitis media. The enlarged glands were mostly situated in the triangles of the neck

and the suboccipital region : some were due to sepsis, others to tuberculosis : bovine tuberculosis is believed to be rare

The author gives much space to hernia, in which he evidently takes a keen interest and surgeons should consult this part of his paper. He reaches the conclusion that umbilical hernia is very common among Xosas and Fingoes of all ages. The proportion in children under two is 40 per cent. ; in adult males 3.2 per cent. In practically every case the origin was congenital. Umbilical hernia is a hundred times commoner in these tribes than inguinal Incarceration and strangulation are rare.

A. G. B

JAVETT (S. N.). *Notes on Some Conditions in Zululand.*—*South African Med. Jl.* 1934 Jan. 27. Vol 8. No. 2 pp 55-56.

A chatty article on malaria, anthrax, amoebiasis, epidermophytosis and ankylostomiasis in natives.

The author holds that neosalvarsan is capable of resensitizing to quinine a patient who has ceased to react to that drug ; he regards it as a useful adjunct to quinine and atabrin. He notes that the use of emetine in natives is followed in 20 per cent. of cases by generalized oedema.

A. G. B

NEDERLANDSCHE VEREENIGING VOOR TROPISCHE GENEESKUNDE.
le Gezamenlijke vergadering met de Belgische Vereniging voor Tropische Geneeskunde op 24 en 25 Maart 1934, in de Afd. Tropische Hygiëne van het Kon. Koloniaal Instituut te Amsterdam. [1st Combined Meeting of the Netherlands and Belgian Societies of Tropical Medicine, Amsterdam, 1934.] [SNIJDERS (E. P.), President.] —*Nederl. Tijdschr. v. Geneesk* 1934. June 23 Vol. 78. No. 25. pp. 2945-2985. With 2 figs (1 map)

At this, the first combined session of the two Societies, a number of interesting papers and discussions took place. The main subjects discussed were (1) plague, (2) schistosomiasis and (3) yellow fever. Much of the treatment and discussion covered familiar ground but some of the points dealt with are of present importance or will bear repetition.

I Plague : Professor L. OTTEN has always maintained a critical attitude with regard to prophylactic and therapeutic measures against plague. In Java much attention has been paid to the possibility of breaking the chain of events leading, by way of the house rat, to epizootic and epidemic plague conditions. An endeavour has been made to carry out a program of re-housing the indigenous population of the interior. This, although ideal, has been costly and is slow in execution ; it would not serve to meet the case of a sudden epidemic. Plague prophylactic vaccination, which does not suffer from this drawback, comes in for criticism on the score of the unreliability of most of the current statistics. Stress is laid upon the necessity of adoption of the alternate case method of procedure to obtain really valid statistical data ; it is "the only way to obtain completely comparable material." An opportunity offered during 1920 to 1922, at the time of a plague epidemic in middle Java, to apply this test for a total of about 37,000 vaccinated individuals and an approximately equal number of controls. The reduction of mortality among the former to one-half of the latter was not a sufficiently striking one to justify the application of the vaccine, which was used at that time upon a large scale. Other vaccines may possibly be more effective, but

before animal experimentation with these can be accepted as applicable to man, it is necessary to realize that the results obtained will depend upon the susceptibility-position of both the animals used and of man to the injection of living test plague bacilli (Otten, *ante*, p. 35). Otten himself appears to favour the use of a living vaccine prepared from a strain of plague which is non-virulent for the house rat. He has obtained such a strain and has applied himself to the question of "dissociation" of the strain into "smooth" and "rough" types. A vaccine of the smooth component proved much the more efficient and that too in such susceptible animals as the house rat and the guinea-pig. Its further use in man awaits a trial.

Professor FLU also presents his case for immunization against plague by means of bacteriophage lysates of virulent plague bacilli (*ante*, p. 34).

II *Schistosomiasis*: The results of schistosomiasis in the province of Katanga (Belgian Congo) were presented by Dr. L. VAN DEN BERGHE. Six different schistosomes are referred to—*S. mansoni*, *S. haematobium*, *S. rodhaini* (found in the mesenteric vessels of a mouse), *S. bovis*, *S. matthei* (found in sheep, oxen and man) and *S. margrebowiei* (found in the mesenteric vessels of certain antelopes). The measurements, together with an illustration, of the eggs of these species are given.

A description of the fresh water snails which harbour schistosome cercariae is given—five genera, *Planorbis*, *Physopsis*, *Lymnaea*, *Bulinus* and *Melanoides*. Of these *Planorbis* is, just as in South Rhodesia, the intermediate host of *Schistosoma mansoni* and *Physopsis* of *Schistosoma haematobium*. Other sections of this paper deal with the pathology of human schistosomiasis in Katanga, medical treatment and prophylaxis.

III *Yellow Fever*: DUREN and VAN HOOFF presented a paper on the preliminary results of an inquiry into the endemicity of yellow fever in the Belgian Congo. This inquiry was entomological, epidemiological and serological. One of the commentaries on the subject is put in the form of three questions relating to the "protection test" for yellow fever as elaborated by the American commission in Lagos. These are:—(1) Has the protection test the value which the American authors place upon it? (2) Do not other affections confer upon the indigenous population a non-specific protective power? (3) Do natives of the country possess, naturally or racially, protective antibodies?

The answers to these questions varied for the authors and those who took part in the discussion. Both positive and negative answers were given.

The conference has evidently been very successful and is to take place alternately in Belgium and the Netherlands. W. F. Harvey.

BUXTON (P. A.) & MELLANBY (K.). The Measurement and Control of Humidity.—*Bull. Entom. Res.* 1934. July. Vol. 25. Pt. 2. pp. 171–175. With 2 figs.

Some of the effects of humidity upon insects cannot be predicted and are inexplicable though important. In experimental work humidity should always be measured and controlled. The difficulties of doing this are considerable, for the experimental entomologist is confronted by problems of many different types.

In the present paper a number of methods are mentioned, one or other of which may perhaps be found useful. For instance, the

humidity of a very small space among growing leaves or in an animal's nest or between the clothes and the body may be measured with about 10 mgm of notepaper, the weight of which is affected by the relative humidity to which it has been exposed - the paper has been previously calibrated and is weighed quickly on a torsion balance. For controlling humidity, mixtures of sulphuric acid and water have generally been used, but it is extremely difficult to obtain a sufficient supply of pure acid in a remote country. It is probable, therefore, that tropical workers will prefer to use aqueous solutions of potassium hydroxide, and that they will welcome the curve which relates the specific gravity of the solution to the relative humidity of the air over it. titration of the solution is no longer necessary.

P. A. Buxton.

MELLANBY (Kenneth) **The Influence of Starvation on the Thermal Death-Point of Insects.**—*Jl Experim. Biol.* 1934 Jan Vol 11. No. 1. pp 48-53. With 2 figs

It is well known that the temperature which is fatal to certain insects is greatly affected by humidity. In the present paper it is shown that it is also much affected by the nutritional state of the insects.

Earlier writers who attempted to define the thermal death-point of insects frequently obtained conflicting results; published figures of *Musca* are at least 5°C from one another. Recent and more analytical work has shown that there are a number of factors, particularly if exposure is prolonged. For instance, if insects are exposed to temperatures above 40°C. for one hour, a very precise lethal temperature may be defined, which is probably due to heat by itself, but on longer exposures, insects will die of heat in moist air, but certain species die at much lower temperatures in drier air owing to exhaustion of water. The author, having standardized these two factors, now proceeds to study the effect of nutrition on the death of newly-hatched larvae of *Pediculus humanus* and adults of *Culex fatigans*. He found that the highest temperature survived for one hour by larval lice is 46.5°C. and that it makes no difference whether they had fed or not. But on a 24-hour exposure, recently fed larvae withstand 38°C. in moist air and 33°C. in dry, larvae which have not been fed die at lower temperatures, there being great variation between one individual and another. Doubtless death is due to exhaustion of reserve food, the rate of metabolism being high at these temperatures. The figures for *Culex* are essentially similar.

[The thermal death-point is a relatively simple matter, yet it involves several factors and an enormous amount of work to define it. Shall we ever get precise knowledge of the conditions which are optimal for life and reproduction?]

P. A. B.

COOK (S. S.). **Insect Control.**—*U.S. Nav. Med. Bull.* 1934. Apr. Vol. 32 No. 2. pp. 229-247.

The paper gives a condensed account of methods of killing insects, particularly those of importance in relation to medicine. It appears to be a sound and up-to-date piece of work, but it does not lend itself to summarisation. As it is rather short, the value might perhaps have been increased if it had included an annotated list of books and important papers on the subject.

P. A. B.

BABER (E). **Note on Experiments made with the Object of finding an Efficient and Economical Insecticide Spray for the Destruction of Mosquitoes and Flies.** *Jl. Roy. Army Med. Corps.* 1934. June Vol. 62. No. 6 pp. 411-418.

The author has endeavoured to find a spray which is efficient and economical, and which must kill adult flies and mosquitoes.

The paper reports a solid piece of work carried out by an approximately uniform procedure. The author has tested a number of proprietary sprays and has made up liquids according to published formulae. He has made a special study of pyrethrum, and he finds it convenient to use the concentrated extracts which are on the market.

In nearly all his tests, he reports a high proportion of recoveries if he examines 3 to 12 hours after spraying; indeed, it seems that he rarely attained a 100 per cent. kill. Mosquitoes were much more easily killed than flies, with very nearly every liquid which was tested. He finds that a saturated solution of naphthalene in commercial paraffin is fairly satisfactory, and that the cost is low. For most purposes, he is inclined to recommend the following formula:—"1: 64 Stafford Allen's liquid extract of pyrethrum + 5 per cent oil of citronella + 15 per cent. petrol + paraffin oil (ordinary burning fluid)." There is some risk of fire from the use of this mixture. P A. B.

GINSBURG (J. M.). **Mosquito Larvicide.**—*New Jersey Agr.* 1933. Vol. 15. No. 4. p. 4. [Summarized in *Experiment Station Rec.* 1934. Apr. Vol. 70. No. 4. p. 509.]

"The author has found that a larvicide consisting of two thirds by volume of kerosene or of a similar light petroleum oil, to which had been added enough pyrethrum extract to equal that of 1 lb of pyrethrum flowers and one-third water containing about 5 per cent of soap, can be prepared or purchased at a cost even lower than that of oil per spray gallon. This stock solution is mixed with 9 to 10 parts of water prior to application and sprayed on the breeding place. It has been extensively used during the last two years by the mosquito commissions in New Jersey and other States on all kinds of fresh-water breeding places with an appreciable saving of money. It is the outcome of work aimed to meet objections to the use of white petroleum oil, which is injurious to waterfowl, fish, and aquatic plants.

FENG (Lan-chou). **A Brief Mosquito Survey in Some Parts of Central China.**—*Chinese Med. Jl.* 1933 Nov.-Dec Vol. 47. Nos. 11 & 12. pp. 1347-1358. With 2 figs. on 1 plate. [18 refs.]

During a period of less than seven weeks (10th August to 25th September) in the summer of 1932, the author made a rapid mosquito survey of "representative parts of three provinces of Central China, namely the Wuhan area of Hupeh, Kiukiang of Kiangsi, and Chinhwa, Hangchow, Wuk'ang and Huchow of Chekiang." The present paper gives lists of twenty-seven species of mosquitoes, including five of *Anopheles*, of which larvae or adults were obtained, and in each case notes are added on breeding places (where known), and the names of associated species are given. The evidence afforded by this collection, so far as it goes, supports WALLACE in placing the boreal limit of the Oriental Region in China at least at 30°N. *Anopheles minimus*, which in South China, as in Tonking and the Philippines, is the most important natural vector of malaria, was found in Chinhwa and Kiukiang.

E. E. Austen.

LEGENDRE (J.). La longévité chez les larves d'un moustique arboricole [**Larval Longevity in a Tree-hole Mosquito.**].—*C. R. Acad. Sci.* 1934. Mar 26 Vol. 198 No 13. pp 1263-1265.

On 7th July, 1932, in a hollow in an elm, the author found larvae, pupae and adults of *Aedes gemiculatus*, a common European mosquito which breeds exclusively in holes in trees. Kept in a bottle, in a mixture of the original and tap water, without food and, during the first winter, exposed to frost, two of the larvae survived without apparent change until 6th January, 1934—a period of eighteen months—when the larger one was found dead, while the other was still alive. Assuming—what has yet to be proved—that such longevity occurs in nature, and that it is followed by metamorphosis into the adult state, Legendre sees therein a means of insuring the survival of the species when faced with unfavourable conditions, such as those resulting from the exceptionally dry summer of 1933
E. E. A.

BRADLEY (G. H.) **A Method for shipping Mosquito Eggs.**—*Jl. Econom. Entom.* 1934 Feb. Vol. 27 No. 1 p. 289.

The term "Shipping" in the title is American for "sending by post." During the autumn and winter of 1932-33, the Bureau of Entomology in Washington was kept continuously supplied with living larvae of *Culex quinquefasciatus* by hatching them from egg-rafts forwarded daily from Florida—a method found preferable to sending larvae in stoppered bottles. After being collected from artificial breeding-places, the egg-rafts were placed in 1½ inch cardboard pill-boxes, each of which could readily contain from 100 to 125 rafts. The preparation, filling and packing of such a box for transmission in an envelope is described. After reaching Washington on the morning of the next day but one, the eggs were floated out into breeding jars, where they promptly hatched.
E. E. A.

HINMAN (E. Harold). **Predators of the Culicidae (Mosquitoes). I. The Predators of Larvae and Pupae, exclusive of Fish. II. Predators of Adult Mosquitoes.**—*Jl. Trop. Med & Hyg* 1934. May 1 & 15. Vol. 37. Nos 9 & 10. pp. 129-134, 145-150 [128 refs.]

The author has collected available information about the destruction of mosquitoes by predators. He discusses the practical application of this work.

The paper includes a large body of fact, some of it original but most of it collected from the literature. The information is arranged under the systematic position of the predator, larval and adult mosquitoes being treated separately. Fish are almost entirely excluded, because a summary of the available information about them was published in 1924. The author has wisely not attempted to be critical.

The lists include an astonishing range of animals. It is quite familiar that mosquito larvae are attacked by Hydra, larval dragon-flies and aquatic bugs and beetles, but it will surprise most readers to see Daphnia, rotifers and leeches in the list of predators. It is also surprising that grasshoppers occasionally prey on adult mosquitoes.

The records which are here gathered together are of unequal value. Some of them relate to observations made in small glass containers in which perhaps there was little chance of escape for the mosquito larva

and little other food for the animal which assumed the rôle of predator. The observations made in the field are of more value, but much more difficult to obtain because the destruction of the insect can only be seen at one instant. It might be possible to carry out experiments under nearly natural conditions in a small tank containing a complex but fully known fauna and flora.

It is difficult to see that much practical use can be made of observations on this subject, and the reader will probably accept the author's conclusion that the predators can only be introduced or encouraged to multiply in small artificial containers of water. P. A. Buxton.

CHÉNEVEAU (R.) Note sur les trous de crabes à Anécho (Togo).

[Note on Crab Holes at Anecho.]—*Bull. Soc. Path. Exot.* 1934. June 13. Vol. 27. No. 6. pp. 590–593.

A further contribution to the fauna of crab holes on the West coast of Africa [see this *Bulletin*, Vol 26, p 807].

At Anecho, Togoland, situated between a lagoon and the sea, in three months the author examined 7,534 crab holes, 2,320 of which are described as large; of the latter two-thirds harboured mosquitoes. Of those sent to Dakar for identification all but two (*A. costalis*) belonged to the genus *Aedes*, probably *Aedimorphus irritans*, which breeds in brackish water and is known to favour crab holes. The author stopped the holes, kept their surroundings as clean as possible and free from vegetation, and maintained fowls and ducks as auxiliaries, the result was encouraging. It is not clear whether *A. aegypti* was found or not [but their larvae have been found by others]. A G. B.

PATTON (W. S.). Studies on the Higher Diptera of Medical and Veterinary Importance. A Revision of the Species of the Genus *Musca*, based on a Comparative Study of the Male Terminalia. II. A Practical Guide to the Palaearctic Species.—*Ann. Trop. Med. & Parasit.* 1933. July 7 & Oct. 21. Vol. 27. Nos. 2 & 3. pp 327–345; 397–430. With 22 figs.

For Part I of this series, in which, on the basis of the male terminalia (genital armature), the species of *Musca* were divided into three groups, see this *Bulletin*, 1933 [Vol. 30, pp. 309–310]. The present contribution includes useful keys, founded on external characters, to the two sexes of sixteen palaearctic species, as well as brief descriptions of and notes on the species themselves. In addition, for the benefit of those who may wish to make quite sure that their specimens are correctly determined, the method of preparing permanent mounts of the male terminalia is described.

So important in medical and veterinary practice are the common house-fly and its allies, and at the same time so difficult to differentiate with certainty, that the author of this elaborate and detailed paper deserves the gratitude of all who may henceforth be concerned with these troublesome insects. The more the pity then that in two several instances (*vertex* in the sense of frons or front, and *posterior pronotum* for humeral callus) his terminology is at variance with that commonly employed among Dipterists; that, in describing the abdomen, he uses *sternum*, instead of ventrite which is logically correct; and that readers are particularly requested to note "that the descriptions of . . . colour markings are drawn up with the head of the specimen directed towards

the observer," which is exactly the opposite of the practice otherwise universal among entomologists, and may entail unfortunate results should reference be made to original authorities. *E. E. Austen*

PATTON (W. S.). Studies on the Higher Diptera of Medical and Veterinary Importance. A Revision of the Tribe Muscini, Subfamily Muscinae, based on a Comparative Study of the Male Terminalia. II. The Genus *Stomoxys* Geoffroy (sens. lat.).—*Ann. Trop. Med & Parasit.* 1933. Dec. 20 Vol. 27 No 4. pp 501-537. With 15 figs

More than eighteen months have elapsed since the author first published his conclusion, based on an examination of male terminalia, that the blood-sucking Muscidae of the subfamily Stomoxydinae are congeneric, and referable one and all to the single genus *Stomoxys* (see this *Bulletin*, 1933, Vol 30, p. 310); and that consequently the retention of such generic designations as *Lyperosia*, *Haematobia*, *Stygeromyia*, etc., is unwarranted. In the present contribution an attempt is made to justify this revolutionary proposal, and in the course of the argument J. R. MALLOCH, prolific writer on the Muscoidea, is severely criticized. The extent to which the author has succeeded in establishing his case is a matter for individual judgment, but a few comments may perhaps be made here

In the taxonomy of the Diptera, most of the plastic differences on which reliance is legitimately placed are those of degree and not of kind; and if divergences such as are exhibited in Stomoxydinae by arista, proboscis, palpi and venation are to be regarded as of less than generic value, classification, far from being simplified, will be rendered more difficult. No systematist will deny the categorical value of the male terminalia in certain cases; but to use them as though they alone need be considered, throughout a group of forms divergent in other respects, is to arrive at a *reductio ad absurdum*.

The categories in Stomoxydinae accepted by Dipterists as genera are based in each case not on one set of characters but on several. If, when reference is made to the male terminalia, *Stomoxys*, *Lyperosia* and the rest are found to be generically inseparable, the logical deduction must be that in this instance, as in others with which the author is possibly unacquainted, the court of appeal selected is incompetent *E. E. A.*

HARVEY (W. Henwood). A Case of Myiasis, due to *Calliphora erythrocephala*, occurring in Man.—*Parasitology.* 1934. June. Vol. 26. No. 2. pp. 306-307.

The patient was a farm labourer of 59 employed near Cambridge. Between 1929 and 1932 three operations were performed for urethral stricture, including suprapubic drainage and for perineal fistula. He continued to get about. In October 1933 living maggots were found in vomit, faeces and urine, the bladder being in a foul condition. The patient died a month later; there was no autopsy. Of 114 flies which hatched from larvae all but three were *Calliphora erythrocephala*. The author believes that there was communication between bladder and intestine and that the eggs may have been conveyed on the man's fingers from the suprapubic sinus to his mouth and then swallowed. The original site of the infestation was probably the opening into the bladder.

A. G. B.

- HOEPLI (R.) & WATT (John Y. C.) **Experiments on Resistance of Dipterous Larvae in Connection with the Problem of Intestinal and Urinary Myiasis.**—*Chinese Med. Jl.* 1933 Nov.-Dec Vol 47. Nos 11 & 12. pp 1298-1306. [19 refs.]

Larvae of *Chrysomya megacephala* and *Lucilia sericata* survived immersion in urine at room temperature without feeding for 48 hours. When fed (in air) for 15 minutes each day, they survived 3 or 4 days. This resistance to lack of oxygen explains how larvae can live in the urinary and intestinal tracts of man. A review of previous work is given

V. B. Wigglesworth

- GALLIARD (Henri) Un nouveau cas de myiase oculaire due à *Oestrus ovis* en France. [A New Case of Ocular Myiasis in France caused by *Oestrus ovis*.]—*Ann. Parasit Humaine et Comparée.* 1934. May 1. Vol. 12. No. 3. pp 177-181. With 2 figs. [26 refs.]

Since the brothers SERGENT, in 1907, recorded the production in Algeria of ocular myiasis in man by larvae of the sheep bot-fly (*Oe. ovis*) [ante, p. 358], similar attacks by this insect upon human beings have been recorded from Sicily, the Cape Verde Is., Constantinople, U.S.A., Spain and Corsica. The few cases of the kind reported as having occurred in France include two in the suburbs of Paris. The instance which has given rise to the paper under review occurred at Lourdes (Hautes-Pyrénées), where larvae were injected into the patient's eye at 7.0 p.m. on August 4th.

Ocular myiasis in man is nearly always due to either *Oe. ovis* or the somewhat smaller *Rhinoestrus purpureus*, the larva of which is normally a naso-pharyngeal parasite of the horse. The distinctive characters of the first instar larvae of these two species are given.

E. E. Austen.

- HULL (J. B.), DOVE (W. E.) & PRINCE (F. M.). **Seasonal Incidence and Concentrations of Sand Fly Larvae, *Culicoides dovei* Hall, in Salt Marshes (Ceratopogoninae: Diptera).**—*Jl. Parasitology.* 1934. Mar. Vol. 20. No. 3. pp. 162-172. With 7 figs.

The authors present a detailed study of the breeding places of *Culicoides* in the south-east United States.

Thanks to the work of this group of authors, a considerable advance has been made in knowledge of the breeding places and seasons of midges (*Culicoides*). They have developed a technique by which they isolate and count larvae from a quart of surface soil; occasionally the number of larvae approaches 200. In the present paper they describe and illustrate the type of spot in which large numbers of *Culicoides dovei* were found. It appears that the larvae require shade and salinity. The observations were made in South Carolina.

P. A. Buxton.

- MOSHKOVSKI (S. D.) & NOSSINA (W.). [A Method of staining Sandflies for Use in the Study of their Biology and Ecology.]—*Med. Parasit. & Parasitic Dis.* Moscow. 1933. Vol. 2. No. 6. pp. 407-409 [In Russian.]

The following method was used for marking sandflies for observations on their bionomics. The dry stain—methylene blue, basic

fuchsin or gentian-violet—was finely powdered and sprinkled over the bottom and walls of a glass receptacle (specimen tube, etc.) When the insects jump about near the wall in their characteristic way, the stain becomes entangled in their hairy covering and is retained there up to 12 days after liberation of the insect. The identification of captured sandflies was made by placing the killed insect on a piece of filter paper and moistening it with a drop of alcohol. The alcohol dissolves the dye and the filter paper shows a blot of the appropriate colour.

C. A. Hoare

WIGGLESWORTH (V. B.) & GILLET (J. D.) **The Function of the Antennae in *Rhodnius prolixus* (Hemiptera) and the Mechanism of Orientation to the Host.**—*Jl. Experim. Biol.* 1934 Apr Vol 11 No 2. pp. 120–139. With 5 figs. [40 refs.]

The scope of this paper is indicated by its title.

The authors describe experiments in which blood-sucking bugs (*Rhodnius*) were subjected to simple stimuli under carefully controlled conditions. The insect is normally in a state of sleep from which it can be roused by bringing a warm test tube near to it. It first raises and extends its antennae, apparently in order to discover the source of stimulus. It then advances, till an antenna touches the tube, when it extends its proboscis and attempts to probe. The authors believe that response is produced by convection currents, and not by radiant heat [a point on which the reviewer is not convinced]. *Rhodnius* possesses also a sense of smell, the sense organs of which appear to be in the antennae.

If the eyes are completely covered with black paint, the insects react normally to a warm tube; they also do this if deprived of the proboscis. If the antennae are removed, the insects see and pursue moving objects, and even without the use of antennae and eyes they respond to vibration.

A number of other topics are discussed. There is a description of several types of sense organs, located in the antennae, and the paper includes a discussion of modern theories of animal orientation. It helps us to understand how it is that a blood-sucking insect finds its host (though the authors only consider insects which are within a few inches of the source of stimulus).

P. A. Buxton.

FENG (L. C.) & HOEPLI (R.). **On Some Histological Changes caused by Mites.**—*Chinese Med. Jl.* 1933. Nov.–Dec. Vol. 47. Nos. 11 & 12. pp. 1191–1199. With 6 figs. on 3 plates. [15 refs.]

The authors support previous observers in finding that the tubular structures extending from the mouth-parts of mites into their host (the "stylostome," "Saugrüssel," "Sangschlauch" or "langue") are really products of a protective tissue reaction on the part of the host. A necrotic area surrounded by inflammatory cells is described in the case of the gecko. In insects (for example, mosquitoes attacked by hydra-chnid mites) the epidermal cells grow downwards from the point of entry of the mouth-parts and give rise to a long chitinous tube with convoluted walls extending far into the insect body. [See also VITZTHUM, this *Bulletin*, Vol. 27, pp. 922–3.] V. B. Wigglesworth.

KOBAYASHI (Y) **On the Bite caused by a "House Tick."**—*Japanese Jl Dermat. & Urol.* 1934 Jan. Vol. 35 No 1 [In Japanese. pp 71-78 With 7 figs [14 refs] English summary pp 7-8]

Mites having the characters of *Liponyssus bacoti* and *L. nagayi* have lately been troublesome in Tokyo and other large cities of Japan. The skin lesions caused, chiefly red papules, are described in two patients.

A. G. B.

MACLEOD (J.) ***Ixodes ricinus* in Relation to its Physical Environment : the Influence of Climate on Development.**—*Parasitology.* 1934. June Vol 26. No 2 pp 282-305 With 6 figs

The author has carried out a number of experiments with ticks, *Ixodes ricinus*, exposing them to controlled conditions of temperature, humidity and pressure. He discusses the theoretical aspect of some of his conclusions.

It is found that this tick can develop over a wide range of temperature from 15 to 35°C. But the favourable range of humidity is very narrow, for the animals only live well in air which is close to saturation. The effect of unfavourable dryness is very complex and appears in different ways in the experiments. For instance, the period between feeding and moulting in the life of the larva is prolonged at lower humidities. The particular tick which the author used—*Ixodes ricinus*—is not of itself of much interest to medicine. But the paper merits study by those who may be interested in the general relation between ticks and climate.

P. A. Buxton

COOLEY (R. A.) **Occurrence of Tick Parasites in Nature in Southern Idaho.**—*Public Health Rep.* 1934. Jan 26 Vol 49 No. 4. pp 111-112

Records the discovery of *Ixodiphagus texanus* Howard on a tick taken from a woodchuck in Idaho; this parasite was last reported in 1907 on the rabbit tick *Haemaphysalis leporis-palustris* Packard in Texas. A. G. B.

DEASIS (Cesareo). **"Red Back" Spider Bite and Magnesium Sulphate Treatment. A Clinical Study of Four Cases.**—*Amer. Jl. Trop. Med.* 1934. Jan. Vol 14. No. 1. pp. 33-44.

The author describes the clinical symptoms which follow the bite of the spider (*Latrodectus hasseltii*), and its treatment by intravenous magnesium sulphate.

The spider is widely distributed (Australia, New Zealand, Philippines), and very venomous. The bite produces immediate and acute local pain followed by numbness; the general symptoms are rapid respiration and high blood pressure, with profuse perspiration and paralysis of the lower limbs. The condition of the patient often remains grave for several days, and the bite is occasionally fatal. Rapid amelioration of the symptoms and improvement of the patient's general condition follow the intravenous injection of 10 cc. of 25 per cent magnesium sulphate, repeated if necessary.

P. A. Buxton.

VELLARD (J.). Variations de la réaction des venins d'araignées
[The Reaction of Spider Venom.]—*C. R. Acad. Sci.* 1934.
June 11. Vol. 198. No. 24. pp 2123-2124.

Some authors have found spider venom to be acid, others alkaline ; WALBUM has shown that the venom of a spider may be sometimes alkaline and sometimes acid. From observations made on spiders in Brazil and in Paraguay the author finds that it is temperature that determines the reaction. At Rio in the hot season almost all the venoms are alkaline ; at S Paulo, a colder region, the venom of the same species is almost constantly acid in winter. A laboratory experiment in which one lot of spiders was kept at 15°C and another at 33°C. led to the same conclusion. Alkaline venoms are more toxic than acid venoms. A. G. B.

CROSFILL (J. W. L.). Notes on an Epidemic of "Spider Burn" in Chungking, during August and September, 1933.—*Jl. Roy. Nav. Med. Serv.* 1934. Apr Vol. 20. No 2. pp. 174-178. With 4 figs.

The clinical features of "spider burn"—the painless, shallow, well defined vesicles filled with yellow exudate—are described, and evidence is brought forward that the condition is due to a secretion by an insect referred to as a "flying ant." [From the author's figure the insect appears to be a Staphylinid beetle probably belonging to the genus *Paederus*. Species of this genus are responsible for "spider lick" and similar conditions in many parts of the world.] During the epidemic in question, almost every person in ships and ashore was attacked. The condition had previously been practically unknown in Chungking.

V. B. Wigglesworth.

BERNTROP (J. C.), Jr. Over ziekteverschijnselen veroorzaakt door in de noordzee voorkomende kwallen. [Symptoms produced by Contact with Jelly Fishes of the North Sea.]—*Nederl. Tijdschr. v. Geneesk.* 1934. May 12. Vol. 78. No. 19. pp. 2084-2089. [Refs in footnotes.] English summary (4 lines).

The occurrence, in the author's own experience, of one or two cases of symptoms developing from contact with jelly fish during bathing is the occasion for this article on the toxic action involved. Most frequently the effects are purely local and amount merely to redness or urticaria. Moreover even these slight effects are by no means invariable. In the more severe cases general symptoms have supervened and these are compared with the effects which led RICHET to the enunciation of the doctrine of anaphylaxis. The immediate effects are given as feeling of extreme fatigue, pallor, small pulse, respiratory distress and excruciating lumbar pain reminiscent of renal colic. This last symptom is ascribed to renal congestion. One medical writer describes his personal impression as being a "sort of enanthem on all mucous membranes." Reference is made to the tropical jelly fishes where the symptoms produced may have a fatal outcome. The remedies used in treatment of the condition have been, the local application of weak ammonia, aspirin, morphine, adrenalin and alcohol. *W. F. Harvey.*

DE JESUS (Zacarias) **Experiments on the Control of the Common Water Leech, *Hirudinaria manillensis*.**—*Philippine Jl. Sci.* 1934. Jan Vol. 53 No 1. pp 47-65. With 2 plates [14 refs]

The author conducted experiments in the laboratory with a view to finding a practical way of controlling or exterminating this leech, which feeds on buffaloes and cattle

The carabao leech, as it is called, is fairly abundant in the Philippines and is found also in Java, Ceylon, Southern India and Siam. It attacks men who work in paddy fields or fish in leech-infested waters. A mature *H. manillensis* can suck 10 to 20 cc. of blood. He found that a 1 in 50,000 solution of copper sulphate killed both young and mature leeches and suggests the broadcasting of this chemical on the water or the dragging of a bundle containing the commercial sulphate through it. If the infested place is limited in area, crude common salt may be broadcast to form a 2 to 3 per cent. solution; tobacco midribs or an infusion of them may be similarly employed. Waste midribs may be dumped into leech-infested places. Either a 1:100 infusion of tobacco or a 5 per cent solution of common salt should be useful in dislodging leeches which have become attached. Derris is poisonous to leeches as it is to fishes and since it grows in the islands its use should be practical and economical. A duck, *Anas boschas* Linn., was found to consume *H. manillensis*, searching for it in infested pools. [It does not appear that the author tested any of the chemical methods in the field.]

A. G. B.

ADAMS (A. R. D.) & WEBB (Lewis). **A Survey of the Protozoal and Helminthic Infestation-Rates of the Male Prison and Reformatory Inmates of Beau Bassin Prison, Mauritius.**—*Ann. Trop. Med. & Parasit.* 1934. Mar. 29. Vol. 28. No. 1. pp 25-35. [18 refs.]

The authors note that apart from hookworm surveys carried out between 1921 and 1923 no investigation of this kind has been made in Mauritius. They mention the mixed character of the population and the primitive habits of the majority, though the estates are well provided with latrines or buckets. The prison in which their observations were made receives its inmates from a prison at the capital, Port Louis, where the prisoners are detained until their conviction and many are treated there with chenopodium as well as for dysentery.

An account is given of previous investigations of this kind both in temperate and tropical regions, this brings out, especially in the tropics, the great variation in the findings, e.g., for *E. histolytica* from 13.7 per cent. at Alexandria (WENYON & O'CONNOR, 524 native prisoners) to 72 per cent. in Panama (FAUST, 2,000 persons). The results are set out in four tables, for protozoa and helminths in 428 adults and 57 children.

The conclusions are as follows:—

"1. In view of an outbreak of an acute type of dysentery with a relatively high mortality, frequently diagnosed locally as 'amoebic' in origin, during the hot months of 1932-33, an investigation was undertaken to determine the relative frequency of the intestinal protozoa, more especially of *Entamoeba histolytica*, among a sample of the general population of Mauritius.

"2. It was found that a neighbouring prison and attached reformatory school provided a suitable field for the enquiry, and the technique employed

for collecting and examining the stools of the inmates of these institutions is described

"3 Three stools from each case were examined in the stated routine manner, final determination of the presence or absence of protozoa and the determination of the species present rested on study of permanently stained wet-fixed films Helminth ova were sought for by a flotation concentration technique

"4 Figures are given in tabular form showing the parasitisation-rates with the various intestinal protozoa and helminths *E. histolytica* was found to be the most prevalent protozoon, 38.5 per cent of 428 adults and 31.6 per cent of 57 juveniles harbouring this parasite Of the helminths, *Trichuris trichiura* was found in 91.1 per cent of the same adults and in 100 per cent of the juveniles.

"5 There is an astonishing diversity between the findings of the various workers in the tropical and sub-tropical zones in respect of the incidence of the intestinal protozoa, more particularly of *E. histolytica*, and one is forced to the conclusion that there may be other factors than simple exposure to infection necessary for successful parasitisation with these parasites and that further reliable records may assist in elucidating the nature of these factors."

The findings for other protozoa were—adults and children, *E. coli* 36.2 and 29.8, *Endolimax nana* 37.6 and 19.3, *Iodamoeba butschlii* 14.0 and 5.3, *Dientamoeba fragilis* 0.7 and nil, *Giardia intestinalis* 10.3 and 8.8, *Trichomonas hominis* 3.3 and nil, *Chilomastix mesnili* 6.8 and 1.8, no protozoa 23.1 and 35.1.

The findings for helminths were—adults and children, *Trichuris trichiura* 91.1 and 100.0, *A. lumbricoides* 15.9 and 63.2, *Strongyloides stercoralis* 4.7 and 3.6, hookworm (Necator) 27.1 and 84.2, *Clonorchis sinensis*, 1.2 and nil, no helminths 4.9 and 0 per cent.

Cestodes are very rarely encountered. *Schistosoma haematobium* is common in Mauritius. *Clonorchis* was found only in Chinese.

A. G. B.

PORTER (Annie). **Remarks on Intestinal Parasites in Montreal, and the Relation of *Entamoeba histolytica* to Colitis.**—Reprinted from *Canadian Med. Assoc. J.* 1934 Vol 30. pp. 134–136.

The opinion current in Montreal that parasitic infection of man does not occur there is unjustified, for Dr. Porter has found 13 species of animal parasites in 139 hospital patients.

Some were from patients suffering from intestinal malaise, others served as controls. Both direct microscopical examination and a concentration method were employed, in intestinal cases from 2–12 stools were examined, in the others one. The organisms found were as follows:—

"Rhizopoda.—*Entamoeba histolytica*, 18, *E. coli*, 7; *Endolimax nana*, 6, *Iodamoeba butschlii*, 3, *Dientamoeba fragilis*, 4.

"Flagellata.—*Trichomonas hominis*, 3, *Giardia intestinalis*, 7, *Chilomastix mesnili*, 19.

"Cestoda.—*Taenia saginata*, 1, *Diphyllobothrium latum*, 2, *Hymenolepis nana*, 1

"Nematoda.—*Trichuris trichiura*, 2, *Ascaris lumbricoides*, 1"

There were 9 double, 5 triple and 1 quadruple infection.

The incidence of *E. histolytica* is relatively high; 29 cases have come under the author's notice at Montreal. The occurrence of 5 species of amoebae as well as of others derived from food shows the care required

in differential diagnosis The investigation, writes the author, demonstrates the need for proper sewage disposal, for the suppression of cyst- and ova-carrying flies, and prevention of contamination of food and water by human excrement The cestode infections indicate the need for scrutiny of meat and fish and for thorough cooking.

A G B.

GILKES (Humphrey A). **Two Little-Known Diseases of Northern Rhodesia: Onyala and Chiufa.**—*Trans Roy. Soc. Trop Med & Hyg.* 1934. Mar. 12 Vol. 27. No. 5. pp. 491-498.

Both these diseases, one unrecorded, are comparatively common in Northern Rhodesia.

Onyala—This disease was described by MASSEY (1904) and WELLMANN (1904) from Portuguese West Africa and from the Belgian Congo (Lualaba river) and by FELDMANN (1905) at Bukoba, now in Tanganyika Territory. In Northern Rhodesia it is found along the railway and in the villages of the Luangwa and Zambesi valleys: it is known as *chilopa* (bleeding disease). 53 cases were treated in the native hospital at Broken Hill between 1920 and 1933, 48 of whom were young adult males, 4 females and one a child, 13 of these died. It is believed to be non-infectious, and there are indications that it is familial; one or two isolated cases may be met with in a village, and it is known to relapse.

Symptoms—Intense pallor, skin usually covered with haemorrhagic areas, subconjunctival haemorrhages. "The inside of the cheeks, lips, and nose, and the palate show thickly distributed umbilicated vesicles about one-third of an inch in diameter. They are usually oval or circular and about the size of a pea. They are trabeculated and contain partly fluid and partly coagulated blood. Haemorrhagic spots occur on the mucous membrane of the larynx, trachea, and vocal cords." Haemorrhages are seen on the pericardium, endocardium and in the heart muscle, in some cases on the lungs, on the peritoneum and kidneys. The oesophagus and stomach contain blood but no ulcers have been seen. The kidney pelves and bladder contain blood, retroperitoneal haemorrhages may be found. No effusion into joints. no enlargement of liver or spleen. no sponginess or swelling of the gums. The chief symptom is the bleeding which begins at the nose and mouth, the clinical picture is that of a man bleeding to death.

Microscopically, the blood gives the appearance of secondary anaemia. The cause is unknown. the suggestion is that it is a deficiency disease of the scurvy type. The author describes treatment but notes that the severe forms are as a rule rapidly fatal.

[Dr. SCOTT gave notes of this disease in his "Medical Research in the Colonies, etc" for 1929: his information came from Dr. A. R. WALLACE of Northern Rhodesia.]

Chiufa.—This is an acute inflammation of the rectum and is described by the author from two cases under his care and from a description by a Jesuit Father who himself suffered from it in 1931 and had seen many native cases. Other names are *chinkumbi* and *kanyemba*. It is found in the Luangwa and Lusenfwavalleys at an altitude of 2,000-2,500 feet. The natives date it back to the epidemic of rinderpest in 1895. Its onset is sudden and it runs an acute course; both the native sufferers seen succumbed after three days.

"The primary manifestation is stated to be a white powdery condition which appears round the anus and gives the appearance of boracic powder

or flour. In women this is stated to cover the vulva also. After a few days this disappears and the patient becomes acutely ill. He complains of pains in the back and neck. His temperature rises to 104°F or higher, he is troubled with excessive sweats which bring the temperature down temporarily, and he becomes very weak. At this time an examination of the anus will show that the skin round it is reddened and hard. The sphincters become relaxed and the anus starts to open out. Soon the anus becomes a gaping orifice over 1 inch in diameter and the interior of the rectum can be seen through it, dilated and red with inflammation. The patient complains of a feeling described as "throbbing" in the rectum, but there is no real pain except in the spine from the cervical to the lumbar regions. Constipation is usual and absolute at this stage. The inflammation retreats further up the rectum as the disease progresses until the colon is involved, and at this stage there may be diarrhoea and vomiting. In women the inflammation is stated to involve the vagina also. The stools are said to be watery and full of mucus. The breath becomes very foul and the patient refuses food and drink. He appears unable to hear or reply when addressed, loses flesh rapidly, and passes urine involuntarily. Through the wide open anus the inflammatory process can be seen extending far up the bowel."

It is thought that the inflammatory condition reaches the splenic flexure.

The likeness of this condition to epidemic gangrenous rectitis of South America is noted, but gangrene is not a symptom in Rhodesia. Rectal schistosomiasis must be suspected. The native treatment to which the Jesuit Father submitted is detailed. Products of seven species of tree are used; most of these contain tannin. The natives consider that Chiufa is water-carried.

A. G. B.

WELCH (T. B.). **Onyalai.** [Correspondence]—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934. June 30. Vol. 28. No. 1. pp 103-104.

With reference to GILKES' paper (above) Welch draws attention to a paper published in 1920 [see this *Bulletin*, Vol. 17, p 241] on a case of onyalai from Kenya: the symptoms were restricted apparently to the skin and bladder and recovery ensued. Onyalai would appear to be widespread though not common in Tropical Africa.

A G B.

MENON (T. Bhaskara). **Splenic Enlargement in South India. A Study based on Post-Mortem Records.**—*Indian J. Med. Res.* 1934. Apr. Vol. 21. No. 4. pp. 695-721. [31 refs.]

The author, who is Pathologist to the Government Royapuram Hospital, Madras, says that there are no figures of the causes of splenic enlargement of S. India. He has therefore studied the post-mortem records of his own hospital and of the Government General Hospital, Madras, over a period of 40 years, paying tribute to the work of the early pathologists. He regards as enlargement anything exceeding 7 oz., which corresponds to the 200 gm. of Dē as the minimum for enlargement in Bengal [this *Bulletin*, Vol. 30, p. 43].

His summary and conclusions are as follows:—

"1. A study of the post-mortem records of 5,054 consecutive autopsies for the last 40 years in the hospitals in Madras shows an incidence of splenic enlargement in 1,101 cases, a percentage of 21.9. This compares favourably with 54 per cent. in Dē's figures for Calcutta and 40 per cent. in Gharpure's figures for Bombay.

"2 Of these cases, the splenic enlargement was slight (below 500 g.) in 66.3 per cent, moderate (between 500 and 1,000 g.) in 24.2 per cent., marked (between 1,000 and 1,500 g.) in 5.4 per cent., and extreme (above 1,500 g.) in 2 per cent, while the weight was not recorded in 2.1 per cent.

"3 These enlargements are classified into various pathological types. Septic enlargement occurring in acute infectious fevers was responsible for the greatest number of cases, viz, 399 or 36.2 per cent; chronic venous congestion for 65 cases or 5.9 per cent, cirrhosis of the liver including Banti's disease for 103 cases or 9.4 per cent; tuberculosis for 84 cases or 7.6 per cent, syphilis for 20 cases or 1.8 per cent; malaria for 124 cases or 11.3 per cent., while kala-azar caused enlargement in 155 cases or 14.1 per cent.

"4 Some uncommon types of splenic enlargement are recorded including one with localized deposit of lipoid material.

"5 No new type of tropical splenomegaly was met with. The difficulty in classifying is mostly due to imperfect investigation.

"6 It is suggested that in some types the splenic enlargement is due to the co-existence of more than one factor each of which by itself may cause enlargement."

The chief causes of the 399 septic spleens were "miscellaneous infective conditions" 90, lobar pneumonia 71, bronchopneumonia 44, septicaemia and pyaemia 48, acute peritonitis 23, abscess of liver 23 (20 amoebic), amoebic dysentery 18, enteric fever 15, pleurisy and empyema 12, bacillary dysentery 9. He suggests that the small figure for enteric is due to the difficulty in obtaining autopsies in that infection. Most of the chronic venous congestion cases were due to cardiac failure.

Of the cirrhosis cases 92 were associated with portal cirrhosis of the liver; 5 are listed as cirrhosis with malaria and 5 as cirrhosis with kala azar and these are discussed with reference to the views of HUGHES [*ante*, p. 341], and of SHANKS and DE. (Whereas most authorities think that there is no evidence for malarial cirrhosis HUGHES disagrees; SHANKS and DE consider that fibrosis of the spleen and cirrhosis of the liver are not regular features of kala azar.) The author obtained evidence of fibrosis in two-thirds of 155 cases of kala azar (all dating from 1903).

The chronic hyperplasias (venous congestion) occur most often in the infective granulomata and in protozoal diseases.

Eight tables illustrate the various types of splenic enlargement.

A. G. B.

REVIEWS AND NOTICES.

JEANSELME (Ed.) [Professeur Honoraire à la Faculté de Médecine et à l'Institut de Médecine Coloniale de Paris, Médecin Honoraire de l'Hôpital Saint-Louis, Membre de l'Académie de Médecine]. *La lèpre*. [Leprosy]—679 pp With 259 text figs, & 14 coloured plates 1934 G. Doin & Cie, 8 Place de l'Odéon, Paris (VIe) [600 Fr.]

This fine volume is weighty in more than one sense of the term, as it scales almost 9½ lbs. It is certainly the most authoritative and complete account of leprosy that has ever appeared in any language and must have taken the distinguished author, who was president of the third International Conference on Leprosy in 1923, years of work, including tours in many countries studying his favourite subject. The numerous figures of cases and of leprosy institutions, together with the beautiful coloured plates illustrating both the naked eye and microscopical appearances, constitute it a veritable descriptive atlas of the disease.

An historical introduction gives a most interesting account of the early history with full references at the foot of each page. The author concludes that none of the suggested references to the occurrence of leprosy in ancient times in Egypt, India, the Bible and in China can be accepted as established. He goes on to trace the generally recognised spread to Greece from Asia Minor in the fourth century B.C. and over Europe and the Western Hemisphere and in recent times, its carriage by the Chinese emigrants to Oceania. The geographical section is equally full and up to date and illustrated by a number of maps and he quotes BURNET'S estimate of five million lepers in the world.

A section on the bacillus of leprosy follows in which all that is best in the work of the early bacteriologists from HANSEN onwards is recorded, together with the most recent information on the subject, including the question of an invisible virus stage of the bacillus, and the conclusion is arrived at that so far only some multiplication of the organism in transplanted living tissues has been obtained outside the human body, but no true subcultures apart from living cells. Further, only localized self-healing lesions have been obtained in monkeys, etc., but no generalization of the disease as in human leprosy. Rat leprosy is included in this full and critical survey; equally valuable sections on serology, immunity and allergy and general anatomy and physiology follow, and in a section on etiology the probable methods of infection and the escape of the lepra bacilli from the body are fully discussed. Great caution is rightly shown in coming to any dogmatic conclusions on points which are still open to debate, but all the important evidence is carefully marshalled and the gaps in our knowledge still remaining are brought out.

The longest section of the work follows on the anatomical-clinical study of the disease. In this the author first describes the naked eye appearances in order from the earliest to the most advanced stages, and he deals with the microscopical appearances of each stage with the clinical ones in a manner admirably adapted to conveying the clearest description of the processes concerned. This section contains very numerous illustrations, mostly from the author's own collection; including the beautiful plates, most of which contain a number of

drawings, especially of the microscopical lesions, which could not be bettered, the whole constituting the best description of the disease as a whole with which the reviewer is acquainted. This part of the work is completed by sections on the evolution and stages of the disease and its prognosis and diagnosis, and he agrees with the recent Philippine Conference's proposal to speak of "arrest," but not "cure" of the disease, as it is just as impossible to say whether the last bacillus has been destroyed in leprosy as in tubercle.

The way is thus paved for the consideration of the very controversial subject of prophylaxis, in dealing with which the author once more effects a happy combination of the best of both the older and the more modern methods, and he speaks with great authority on account of his having paid personal visits to many of the great leper institutions of the world. In the first section he concluded that the middle ages crude compulsory methods were probably one factor in bringing about the reduction of the disease in Europe, and he supports the general conclusion that the humane Norway system greatly reduced leprosy in the latter half of the last century in that country. He points out, however, the advantages of leper colonies apparently first organized by General Gallieni in Madagascar, and of dispensaries in attracting voluntary admissions for the sake of treatment, and emphasizes the fact that at the present time only Japan and two South American Republics enforce rigid isolation of all lepers. The importance of separating the children of lepers from their infected parents as soon as possible after birth is stressed, and sterilization of lepers to limit the number of their children is discussed.

The last section on treatment commences with hygienic measures, including diet and exercise, and also deals with the evidence concerning the very limited value of the older metallic and other drugs, as well as local and physical methods to relieve deformities. About one half of the space is allotted to a full account of the preparations of chaulmoogra and hydnocarpus oils and the results of the modern treatment by injections of soluble active portions of the oils, in which both the advances that have accrued from their use and their limitations, especially in advanced cases in elderly patients, are brought out.

Only one minor printer's error, in spelling Mouart "Monat," has been noted. It is impossible to praise this book too highly and the reviewer would express the hope that the issue of a cheaper edition may increase its usefulness.

Leonard Rogers.

GATER (B. A. R.) [King Edward VII College of Medicine, Singapore].
Aids to the Identification of Anopheline Larvae in Malaya.—160 pp.
With 187 figs. 1934. Singapore: Published by the Government
of the Straits Settlements and the Malaria Advisory Board,
Federated Malay States. [\$1.]

As is explained in the Introduction, this useful handbook has been produced in response to an urgent request from the above-mentioned Board for reliable keys and descriptions, which should include the entire Malayan anopheline fauna at present known. Since additions to the latter may eventually be discovered, all species hitherto recognized in the Malayan sub-region and Siam have also been tabulated. Thirty-four species of anopheline mosquitoes, besides several subspecies and varieties, have been recorded as occurring in Malaya so that unless a key is based on a study of all the species in the area in which it is to be

used, mistakes in identification are bound to occur. Nevertheless, anything like finality is for the moment impossible. A complete survey of the mosquitoes of Malaya has yet to be undertaken, and in some cases descriptions have had to be based on insufficient material, while on the other hand the larva of the Bornean *Anopheles errabundus*, and that of a species recently found by WILLIAMSON at Cameron's Highlands, and allied to *A. jamesi* but probably new, are as yet unknown. In the circumstances, the author emphasizes the preliminary nature of the present publication, and requests the co-operation of others with a view to the production of a revised edition. Meantime, supplementary information is to be published at intervals in the *Malayan Medical Journal*.

In addition to a "Table for Rapid Identification" and "Brief Descriptions of Species," the work before us comprises a general account of the anatomy and habits of anopheline larvae, "together with notes on classification and nomenclature, collecting, rearing, preserving, mounting and other cognate subjects," including instructions for the making of surveys. As regards the latter it is urged that, since the larval population may be subject to much seasonal variation, surveys in important areas should if possible be made for a year, at regular monthly intervals and, in order to afford a correct picture, should be accompanied by records of adults.

Non-specialists, and students of limited experience, are liable to err when using even the best constructed key, and the author rightly insists that, when a specimen "has been identified by the use of the Table, it should always be gone over in detail with the Brief Description." Following the "Table for Rapid Identification," which occupies twelve pages and is constructed on the readily intelligible dichotomic system, ninety-one pages are devoted to "Brief Descriptions of Species" (larvae only). At the end of each description, which is accompanied by clearly drawn figures of diagnostic characters, notes are given on habitat and on the relation of the species to malaria; and it is to be observed that, in the case of twenty species or subspecies, there is either "no evidence" or "it is considered unlikely" that the insect plays any part in transmission.

Two Appendices (the first dealing with "Equipment," and giving names and addresses of manufacturers, with prices; the second consisting of lists of "Species Recorded from Neighbouring Countries" and islands) conclude a practical and well-arranged guide, the utility of which will certainly not be confined to Malaya. *E. E. Austen.*

BUREAU OF HYGIENE AND TROPICAL DISEASES.

TROPICAL DISEASES BULLETIN.

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THE TRANSMISSION OF CHAGAS' DISEASE.

A CRITICAL REVIEW.

By Cecil A. HOARE, D.Sc.

(Wellcome Bureau of Scientific Research, London.)

(Received September 7, 1934.)

Although twenty-five years have passed since CHAGAS (1909, 1909a) published the first account of South American human trypanosomiasis or Chagas' disease, discovered by him, our knowledge of this malady is still very imperfect and there are many obscure points in its symptomatology and aetiology which require elucidation. One of these is the question of the natural method of transmission of the infection, which is closely connected with the mode of development of the causative agent, *Trypanosoma cruzi*, in the insect vector, represented by blood-sucking Reduviid bugs of the genera *Triatoma*, *Rhodnius* and *Erathyrus*.

Regarding these problems there has been a long-standing controversy between the followers of CHAGAS, who holds that the final infective stages of development of the trypanosome occur in the salivary glands of the insect-host and that transmission is inoculative, through the bite of the insect, and those of BRUMPT, who maintains that the life-cycle of *T. cruzi* is completed in the hind-gut of the insect and that transmission is effected by faecal contamination of the mucous membranes of the vertebrate. In some text-books, writers have compromised by admitting both methods of transmission, maintaining, however, that one of them was merely of secondary importance (cf. WENYON, 1926, BRUMPT, 1927, REICHENOW, 1928, CHAGAS, VILLELA and ROCHA-LIMA, 1929). Both this controversy and the non-committal attitude were due chiefly to the scarcity of experimental data capable of establishing the claims of one of the rival hypotheses to the exclusion of the other. A critical revision of the life-cycle of *T. cruzi* has recently been undertaken by DIAS (1934) [this *Bulletin*, Vol. 31, p. 597] and, since it settles the question under discussion beyond reasonable doubt, this is an opportune moment to review the situation historically and in its present state.

As there seems to be some confusion regarding the nomenclature of the parasite causing Chagas' disease, it should be noted that it was

originally named *Trypanosoma cruzi* Chagas, 1909. Having discovered what he believed to be stages of schizogony of this flagellate in the lungs of the mammalian host, CHAGAS (1909a) renamed it *Schizotrypanum cruzi*, but after it was demonstrated that these stages belonged to a different organism (*Pneumocystis carinii*) CHAGAS (1911) reverted to the original name, *Trypanosoma cruzi*. Since the two generic names are being used indiscriminately, it is well to point out here that *T. cruzi* is the only valid one, *S. cruzi* being its synonym.

In his earliest accounts of the life-cycle of *T. cruzi* CHAGAS (1909a, 1911) recognised two types of development of this trypanosome in *Triatoma*: (1) asexual, taking place in the mid-gut and leading to the formation of crithidia, and (2) sexual, with the production of infective forms in the salivary glands. This interpretation of the life-cycle of *T. cruzi* has—with various modifications—been maintained by CHAGAS up to the present time on the following grounds: (1) the finding, on two occasions, of trypanosomes in the *body-cavity* of some "wild" bugs, (2) the finding, on three occasions, of trypanosomes in *smears of the salivary glands* of bugs, and (3) his belief that *T. cruzi* was sexually dimorphic, the slender blood-forms representing "males" and the broad ones "females." On being taken up by the bugs these forms were supposed to take part in a sexual act (as yet not observed by the author), the resulting stages giving rise to infective trypanosomes which penetrate from the gut into the body-cavity and thence into the salivary glands. According to CHAGAS, infection of the vertebrate host is effected through the bite of the insect.* The "asexual" cycle of development was said to be of no significance, being merely a culture of the flagellate which remains non-infective.

The study of the life-history of *T. cruzi* was soon taken up by BRUMPT and others. BRUMPT and SILVA (1912) produced the first evidence that the excreta of bugs (*Triatoma*) harbouring *T. cruzi* were capable of infecting mice when injected intraperitoneally, whereas no infection resulted from the bite of these insects. BRUMPT (1912) next gave a description of the entire development of this trypanosome in *Triatoma*, which, according to him, proceeds as follows. In the gut of the bug the ingested blood-trypanosomes are transformed into crithidia; in this stage they multiply, gradually diminishing in size, and finally give rise to trypanosome forms again. These metacyclic trypanosomes (to use the modern term introduced by BRUMPT in 1913) are passed with the faeces and constitute the final infective stage, excreta containing only crithidia being incapable of setting up an infection. BRUMPT has also shown that the blood-trypanosomes regarded by CHAGAS as "male" and "female" forms are actually stages of growth, the former being the recent arrivals in the blood from the tissues, where multiplication takes place, while the latter are the result of the growth of these. Continuing his investigations, BRUMPT (1912a, 1913, 1913a) succeeded in infecting various mammals by placing the excreta of the bugs containing metacyclic trypanosomes upon the mucous membrane (*per conjunctivam, os et rectum*) and upon the intact skin (in young mice). However, all attempts to infect animals through the bite of infected bugs failed. BRUMPT's observations have thus demonstrated that the final stages of development of *T. cruzi* occur in the hind-gut of the bug and that the infection of the vertebrate host takes

*Though the author claims to have infected animals by this method, the results are open to criticism in view of the absence of any details regarding these experiments.

place by *contamination* with faeces containing the metacyclic trypanosomes. Both in his earlier and later works, however, BRUMPT admitted the possibility of infection through the bite, but regarded this method as exceptional and the localization of the flagellates in the salivary glands as accidental (BRUMPT, 1912a, 1927).

What can now be regarded as an amplification and confirmation of BRUMPT's account of the life-cycle of *T. cruzi* was provided by KOFOID and McCULLOCH (1916) in their study of the development of *T. tritoma* from *Tritoma protracta*. This parasite has recently been shown by KOFOID and DONAT (1933, 1933a) to be closely related—if not actually identical, as the authors maintain—to *T. cruzi*. These observers successfully infected rats with a *T. cruzi*-like parasite by feeding the bugs to them, whereas attempts to infect through the bite failed. A number of other authors also reported positive results obtained by the contaminative method and failure to produce infection through the bite of the bugs.

On the other hand, CHAGAS' views found support in the experiments of TORRES (1913, 1915), who succeeded in infecting laboratory animals, in 3 cases (2 kittens, 1 guineapig) out of 18, by allowing infected bugs to feed on them. The bugs were placed singly in narrow tubes and had to bite through a double layer of gauze. The author regarded these precautions as sufficient to exclude any possibility of contamination of the skin with the excreta of the bug.

CHAGAS himself re-stated his old views in several new publications. In these he claims to have discovered the actual process of fertilization between "male" and "female" trypanosomes in the mid-gut of the bug (CHAGAS, 1921, and in an undated pamphlet apparently prior to 1921); of this an illustrated description was given later (CHAGAS, 1927). BRUMPT's findings were also taken into consideration but interpreted in such a manner as to fit in with CHAGAS' own hypothesis. Some difficulty was experienced, however, with the metacyclic trypanosomes. They were first (CHAGAS, 1921) regarded as the intermediate forms between the products of fertilization and the salivary gland stage of the trypanosome. Later, having discovered slender trypanosome forms in the mid-gut, CHAGAS (1927) associated these with the salivary gland stage, now relegating the metacyclic trypanosomes to the asexual cycle of development and regarding them as derived from "asexual multiplication of the male blood forms." Lastly, without any further explanation, the metacyclic trypanosomes were again included in the sexual cycle, leaving the crithidia as the final stage of development in the asexual cycle (CHAGAS, VILLELA and ROCHA-LIMA, 1929). In all these papers CHAGAS reasserts his belief in the inoculative method of transmission as the only normal one, while the contaminative method, though admitted, is regarded as an exception. The only data on which these views are based are the author's finding of trypanosomes in the salivary glands in 1909, which has never been confirmed, and the experiments of TORRES referred to above.

It is thus seen that the solution of the problem of the method of transmission of *T. cruzi* had not advanced materially during the twenty years just surveyed. Though the views held by BRUMPT, based on exact objective observations and experiments, have found more general recognition, CHAGAS' hypothesis, in spite of its highly speculative and subjective character, has never yet been entirely refuted. The problem could only be settled by a revision of the whole subject, in which the claims of both schools are experimentally tested and critically

examined in greater detail and on a larger scale than has hitherto been attempted. This task has recently been carried out at the Instituto Oswaldo Cruz by DIAS (1932, 1932a, 1932b, 1934).

This author confirmed and amplified BRUMPT's observations, but was unable to substantiate most of CHAGAS' statements, while for some he provided a different explanation. The life-cycle of *T. cruzi* was studied by DIAS in *Triatoma megista*. He found that the entire development normally takes place within the lumen of the alimentary tract (only exceptionally in the Malpighian tubes) and occupies from 6 to 15 days, according to the stage of the insect. The transformation of the blood trypanosomes into crithidia takes place in the stomach, while their multiplication proceeds in the posterior portion of the mid-gut. In the mid-gut are also found degenerating flagellates and leishmania, the latter constituting an inconstant phase. In the hind-gut, represented in the bug by the rectum alone, the crithidia become smaller and give rise to the metacyclic trypanosomes. These are discharged with the excreta (faeces and "urine,") in which their number has been estimated at 3,500 per 1 cmm.

Although numerous insects were examined at various periods of the infection, DIAS (1934) "never encountered any evidence of sexual phenomena in the trypanosomes, nor any forms of the parasite which could be interpreted as resulting from such phenomena." The only true trypanosomes discovered in the mid-gut were *unaltered blood-forms*, which can remain there without development for several days. Likewise this observer failed to find any forms of the flagellate in the salivary glands or in the body-cavity of the bug. Though he succeeded in obtaining infection of the body-cavity of *Triatoma* by direct inoculation into it of flagellates, which completed their development in this situation up to the formation of metacyclic trypanosomes, he could obtain no evidence, even under such favourable conditions, of invasion of the salivary glands.

The experiments on the transmission of *T. cruzi* carried out by DIAS were numerous and varied. In attempts to transmit the trypanosome through the bite, 104 *Triatoma megista* were fed on 14 guineapigs, but in no case was an infection produced. In these experiments the risk of contamination with the faeces of the bugs was entirely eliminated. On the other hand, DIAS invariably succeeded in infecting laboratory animals by contamination of the mucous membrane with the excreta of the bug; he was likewise able to produce infection in guineapigs and mice by placing the droppings of infected triatomas on the intact skin and by feeding bugs to these animals. DIAS also tested the infectivity of the mid-gut stages of *T. cruzi* by inoculating the intestinal contents into laboratory animals, and found that they were capable of producing an infection during the entire period of development of the parasite (up to 8 days after the infective feed). The infection in such cases was undoubtedly produced by the surviving blood-forms mentioned above, since they were actually seen in the inoculum and, moreover, no infection could be produced with the mid-gut contents of bugs with old infections in which only crithidia were present.

DIAS has thus amply confirmed the fact that the normal and infallible method of transmission of *T. cruzi* to the mammalian host is exclusively by contamination of the mucous membranes or skin with the excreta of the bug containing metacyclic trypanosomes, as in the case of other trypanosomes of the *T. lewisi* group with a similar type of development

in the "posterior station" of the invertebrate host (*cf.* HOARE and COUTELEN, 1933)

On the other hand, CHAGAS' hypothesis was deprived of its main supports, for no indication could be found either of any sexual phenomena or of the presence of flagellates in the salivary glands, which disposes both of the alleged sexual dimorphism of *T. cruzi* and of the inoculative method of its transmission. The evidence in favour of the latter actually consisted only of three cases of alleged infection through the bite of the bugs (TORRES, 1915), in which some attempt was made to exclude contamination.* Even if these precautions are regarded as flawless, it is quite possible that the infection was actually brought about by the blood-forms surviving in the gut of the bugs, which were shown to be infective (see above), and which might conceivably be regurgitated in the act of feeding.

It must be stated that DIAS (1934) himself compromised by admitting the possibility, in exceptional cases, of *T. cruzi* behaving in the manner described by CHAGAS, but the mass of evidence against this view renders even such a concession untenable.

In the foregoing account of *T. cruzi* only its development in the natural intermediate hosts (*Triatoma*, etc.) was dealt with. It is known, however, that under experimental conditions the parasite is capable of developing in bugs of the genus *Cimex* and in ticks of the genus *Ornithodoros*.

We can now consider the bearing of the laboratory experiments upon the natural transmission of Chagas' disease in man. Though no direct observations have been made on this subject, the habits of the Reduviid bugs leave no doubt that human beings are infected in the same manner as other mammals. Thus, the principal insect-vector in Brazil, *Triatoma megista*, is always found in large numbers in the dwellings, where it feeds upon human beings during the night. The bugs usually attack the face and lips of the sleepers (hence the names "barbeiros," or barbers, and "kissing bugs"), and while feeding and after a meal they habitually defaecate. According to DIAS (1934) in the endemic districts these bugs are commonly found in the beds of the inhabitants, the bedding being usually soiled with the excreta of the bugs and with blood-spots from crushed insects. It is conceivable that under these conditions infection can be produced by the droppings either contaminating the mucous membranes of the mouth, nose or eyes directly, or being introduced into the skin by scratching, while infection through the intact skin is not excluded.

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*Other experiments, in which no allowance was made for possible contamination, need not be taken into consideration.

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HELMINTHIASIS.

MAPLESTONE (P. A.). **Intestinal Helminth Infections found in India : the Laboratory Diagnosis and Treatment. Methods employed at the Calcutta School of Tropical Medicine.**—24 pp With 2 plates. 1934. Bengal Govt. Press, Alipore, Bengal. Also **The Laboratory Diagnosis and the Treatment of Helminth Infections.**—*Indian Med. Gaz.* 1934. May. Vol. 69. No. 5. pp. 266-273. With 27 figs. on 2 plates

The three parts of this paper describe the methods employed at the Calcutta School of Tropical Medicine for the laboratory diagnosis and treatment of the intestinal helminthic infections met with in India

Part I. All modern concentrative methods used for the discovery of eggs depend on floatation. Of these the best is D.C.F. But for those without a centrifuge Willis's technique, performed with due attention to its limit of effective concentration and with half an hour's standing, is advised. It is recorded that though it was first published by WILLIS [this *Bulletin*, Vol. 19, p 246] it was really devised by Maplestone and suggested to Willis by him. It is claimed that if no hookworm eggs are found "after the examination of a patient's stool on two different days it may safely be concluded that hookworms are not present in sufficient numbers to produce symptoms of disease."

Part II describes first the eggs which are found by the above technique (hookworm, fertile ascaris, trichuris, trichostrongylus, enterobius, heterodera, strongyloides, *Hymenolepis nana* and *H. diminuta*), and those which are not (unfertile ascaris eggs, those of *Taenia saginata* and *T. solium*, *Bertiella studeri*, *Fasciolopsis buski*, *Gastrodiscus hominis*, *Paryphostomum sufraginifex* and *Heterophyes heterophyes*).

Part III deals with those drugs which Maplestone has found the most effective. Regarding carbon tetrachloride it is noted that a considerable number of deaths from this drug have occurred in labour forces in India, some of which he attributes to the concomitant effects of alcohol, others to idiosyncrasy. Accordingly Maplestone has abandoned it. Tetrachlorethylene combined with oil of chenopodium [*ante*, p. 393] is the treatment advised for hookworm infection; oil of chenopodium in three 10 minim doses in capsules at hourly intervals [2 cc. in all] for ascaris. Against trichuris his impression is that tetrachlorethylene is better than carbon tetrachloride. Trichostrongylus infection, it is stated without qualification, is never heavy enough to give rise to symptoms, but under tetrachlorethylene eggs have disappeared. For the tapeworms, carbon tetrachloride 3 cc. (M 45) is advised, or, if contraindicated, 1 gm. (grains 15) of hexylresorcinol in hard gelatin capsules. Gentian violet has been tried for strongyloides without much success. Thymol is unmentioned, it being not stated whether it has not been tried or has been found wanting.

Clayton Lane.

VAN DEN BERGHE (Louis). Une enquête helminthologique à l'école professionnelle de la Kafubu (Katanga). [*Helminthological Enquiry at the Medical School, Katanga.*].—*Ann. Soc. Belge de Méd. Trop.* 1934. June 30. Vol. 14. No. 2. pp. 193-197.

This helminthological enquiry places schistosomiasis as the most important helminthic infection in Katanga.

Faecal diagnosis was by 3 smears in normal saline and two preparations by a Willis technique in 183 inhabitants of villages close to the Northern Rhodesian border. The urine was centrifuged and all the deposit examined. The percentage findings in faeces were hookworms 64·5, *ternidens* 2·7, both these 1; *strongyloides* and *trichuris* one case of each; *ascaris* was evidently absent, *taenia* 3 cases, *hymenolepis* 1 case, *S. mansoni* 8 per cent, *S. haematobium* 2 per cent. In the urine *S. haematobium* ova were found in 73 cases (40 per cent.) and in view of the fact that albuminuria is relied on in laboratories to disclose this infection, it is noted that 22 of them had none. Moreover 11 more cases showed albumin, pus and red corpuscles in the urine but no ova. Both kinds of ova were found in the urine in 2 cases. Treatment of all infected persons led to no permanent reduction, owing doubtless to reinfection, and for this there is ample opportunity since *Limnaea natalensis*, *Physopsis africana* and *Planorbis adowensis* abound, the 2 last being carriers of schistosomiasis. The small canals swarm with planorbis, 200 being found in a length of one metre. Urinary infection is spreading rapidly from the Rhodesian boundary. The only feasible method of prevention is the adequate disposal of faeces by a means which should be adoptable in schools, colleges, and police lines. C. L.

MAURITIUS. Annual Report of the Bacteriological Laboratory for the Year 1932 [ADAMS (A. R. D.), Pathologist and Superintendent]. 11 pp.

In the Annual Report for 1932 of the Bacteriological Laboratory, Mauritius, there are points of general interest.

In an excised appendix which displayed to the naked eye many apparent miliary tubercles, the microscope showed *bulharzia* ova as their cause. These, too, were found in an epithelioma of the cervix uteri, tartar emetic was given and 14 months later the amputation stump was healthy. Although miracidia of *S. haematobium* swarmed about 200 of each of *Limnaea mauritiana*, *Physa borbonica*, *Melania tuberculata*, *M. scabra* and *Paludina zonata*, in no case was penetration observed or infection established on dissection [see ADAMS p. 774]. A heavy untreated infection by *Plasmodium tenue* was observed twice daily for three days and over that period these forms were steadily but not completely replaced by rings, apparently of *P. falciparum*. C. L.

EGYPT, MINISTRY OF THE INTERIOR. DEPARTMENT OF PUBLIC HEALTH. Research Institute and Endemic Diseases Hospital. Second Annual Report 1932 [KHALIL BEY (M.), Director].—38 pp. With 3 figs. on 2 plates. 1934. Cairo: Govt. Press. [P.T. 12.]

This report covers the activities, routine and experimental, of this Institute and Hospital during its second year, in the course of which it was inaugurated by King Fouad. Most of the experimental work has been published elsewhere and abstracted in this *Bulletin*.

Treatment by a mixture of carbon tetrachloride, ascaridole and K.1750 (a resorcinol derivative) was very disappointing for *A. duodenale* and *T. saginata*, gave good results for *ascaris*, and has the disadvantage of great bulk. Mosquitoes, both female and male, have been induced to feed on blood from a pipette, and it is hoped thus to determine the amount sucked in for a single meal. *Culex pipiens* was found naturally infected with microfilariae in a village in Shargiya

Province and breeding freely in wells. In the clinical report it is noted, first that of 2,279 persons who had 9 or more injections with foudadin 62.2 per cent were cured of schistosomiasis after 9, 82.7 per cent after 11, and 86.8 per cent. after 13 of these; and second that in the treatment of pure ancylostome infection the dosage of carbon tetrachloride was 5 cc. in 30 cc. of water for a man of 60 kilos. Of 1,255 cases re-examined after one such treatment 50 per cent. were still infected to an unstated diagnostic technique [At the risk of once again being dubbed "reactionary" and "prejudiced" the reviewer cannot escape the responsibility of pointing out that this percentage of disinfestation is considerably less than that given by particulated thymol; while as to risk, the 19 deaths in 1,600,000 Egyptians reported by TOMB and HELMY after carbon tetrachloride [*ante*, p. 109] should be compared with no deaths in 1,600,000 persons treated by ASHFORD with thymol in Porto Rico.]

C. L.

RUSSELL (Paul F.). **Racial and Age-Group Incidence of Common Intestinal Helminths in the Straits Settlements.**—*Malayan Med. J.* 1934. Mar. Vol. 9. No 1. pp. 17-22. With 5 figs.

Russell's conclusions based on the examinations of 27,000 stools by a direct gravity floatation technique are as follows:—

"The incidence of hookworm infection among Malays, Chinese and Indians alike in the Straits Settlements tends to become greater in the older age groups. The incidence of roundworm and whipworm infection, on the contrary, tends at first to rise but then to fall as the age increases, regardless of race.

"The incidence rates in all age groups for all three parasites are higher in Malays than in Chinese and Indians. Chinese have the lowest incidence rates in all age groups for hookworms and roundworms. But the incidence of whipworms tends to be significantly higher in the Chinese than in the Indians."

C. L.

GIOVANARDI (Augusto) & MONDOLFO (Ugo). L'elmintiasi in alcuni centri rurali della Romagna. Ricerche parassitologiche ed epidemiologiche. [**Helminth Infection in Rural Centres of the Romagna.**]—*Giorn di Bacteriol. e Immunol.* 1934. June. Vol. 12. No. 6. pp. 1121-1160. With 2 plans & 4 figs. [117 refs.] English summary

An investigation in three rural centres near Romagna (south of the Po) gave the following results.

Faecal smears of 519 persons belonging to 114 families showed these percentages of infection: *Ascaris* 46, *trichuris* 7.68, *enterobius* 0.76, and *taeniae* 0.76. The ages most affected were 1 to 15, and women were more so than men. Privies are present but little used on account of their condition, so that there is much fouling of the surroundings of houses; eggs of *ascaris* and *trichuris* have been found on the floors of and round privies and in domestic and school refuse (so that they may be conveyed by the feet of man and animals, on the hands of mothers and children, and on vegetables) but not in water or on flies. Attention is drawn to analogies in the epidemiology of helminthiasis and of typhoid, and the need for improving rural surroundings is urged.

C. L.

WIGAND (R.). Klinisch-parasitologische Beobachtungen [Clinical Parasitology].—*Deut. Med. Woch.* 1934. Mar. 30 Vol. 60. No. 13. pp. 461–464. With 3 figs [13 refs.]

This investigation deals with 1,330 in-patients in East Prussia, namely 1,000 adults and 330 of 14 years or under

Hydatid, hookworm, trichinella and strongyloides are absent or almost so, and thread worms are not necessarily discovered by faecal examination. The percentage of ascaris infection was highest in skin diseases, 13·3; respiratory diseases showed 9·4, and bacterial infections 8·8. The high incidence in skin diseases is associated by Wigand with the anaphylactic skin reactions which may accompany this infection, that of respiratory diseases with the larval pulmonary journey, and that of bacterial infections with the suggestion that the larvae act as "pacemakers" to bacteria, but he notes that for the province there is an average ascaris infection of 30·2 per cent., and that any illness of the host which makes the worms ill results in their expulsion; so that the more reasonable explanation surely is that a skin disease affects ascaris little, while a general infection with fever results in their early expulsion. Eosinophilia in worm infections was as variable as usual. In pernicious anaemia the liver of the burbot (*Quappe*, *Lota lota*) was efficacious in pernicious anaemia, judging by reticulocytes, haemoglobin and number of erythrocytes; but owing to the possibility of causing infection with *Diphyllbothrium latum* it should never be eaten raw. Fouadin, given as KHALIL advises, proved useless against opisthorchis as judged by the findings of eggs in stool or by duodenal sound. C. L.

BRÜNING (H.). Eingeweidewürmer und ihre Bekämpfung. [Intestinal Worms and their Control].—*Deut. Med. Woch.* 1934. Mar. 23. Vol. 60. No. 12. pp. 425–431

A tabular description of intestinal worms and instructions for their treatment which need to be accepted with reservation. Thus, while it is said that the genital pores of the taeniae lie irregularly to the right or left side (seitlich), those of *diphyllbothrium* are said to lie on one side (seite) only. Of the hookworms, only *A. duodenale* is mentioned. The dosage of oil of chenopodium is stated in drops, although the size of a drop differs with the dropper and confusion between drops and minims has killed quite enough people already. The advised dose of thymol is 10–20 grams daily or say half an ounce on an average. C. L.

CAMERON (Thomas W. M.). Parasitic Diseases Common to Man and Animals.—*Brit. Med. J.* 1934. June 23. pp. 1110–1112.

A general survey of some helminthic parasites of man. Those living as adults in man and animals are divided into "normal," namely, those forms sufficiently frequent in man to be so termed, and abnormal, those which are not. Among the second group which live as adults in man and as larvae in animals are placed *Taenia solium* and *Trichinella spiralis*; while in the third, living as larvae in man and adults in animals fall hydatid disease and cercarial dermatitis. C. L.

MONNIG (H. O.). **Erratic Worm Parasites in Man.**—*South African Med Jl.* 1934. July 14. Vol. 8. No. 13. pp. 475-476.

Monnig points out that worm parasites have often to journey within the host before reaching their final habitat, and that in doing so they may stray.

There are instanced skin reactions allergic or otherwise (including creeping eruption); the usual habitats or wanderings of *F. hepatica*, *D. dendriticum*, *S. haematobium*, *C. cellulosae*, *A. lumbricoides*, *E. vermicularis*; and the author's findings of 126 segments of *Taenia saginata* in material removed from the frontal sinus of a girl suffering from persistent epistaxis. Prenatal infection is probably commoner than is at present suspected. C. L.

FERNANDEZ (Fidel). **Parasitismo intestinal y jugo gástrico [The Gastric Juice in Intestinal Parasitism.]**—*Medicina Paises Cálidos.* Madrid. 1934 July. Vol. 7 No. 7 pp 336-338

Evolution of intestinal parasites occurs altogether independently of the chemical type of the gastric juice. In 60 cases of diarrhoea with protozoal or helminthic parasitism in the bowel, gastric acidity was excessive in 14, normal in 18, subnormal in 13, and absent in 15. The percentages of cases with normal or excessive acidity were for parasitized 53.3 and for non-parasitized 65.5, the corresponding figures for lessened or absent acidity being 46.6 and 34.5. C. L.

GIRGES (Rameses) **Helminthic Dyspepsia in Egypt.**—*Jl. Egyptian Med. Assoc.* 1934. Feb Vol 17. No. 2. pp. 208-218.

"It is a good counsel, when puzzled over some obscure dyspeptic condition in any patient, to bear intestinal worms in mind"

The factors concerned in producing helminthic dyspepsia are put as being toxins, anaemia, irritation and chronic inflammation of the stomach, intestinal catarrh and chronic nephrosis. The clinical manifestations are put as being derangement of appetite (excessive, deficient, odd, or perverted), effects of fasting and of thirst, sensory, motor and functional disturbances either connected or unconnected with meals, and vasomotor disturbances. C. L.

ELDIN (M. Salah) & HASSAN (A.). **Gastric Functions in Helminthic Infections.**—*Jl. Egyptian Med. Assoc.* 1933. July. Vol. 16. No. 7. pp. 735-752. With 14 figs. [13 refs.]

Ankylostomiasis and intestinal schistosomiasis were found responsible for variations in the gastric secretions.

In 40 unselected cases of helminthic infections, single and multiple, 71 fractional test meals were investigated. Of these cases 10 were normal, 8 showed hyperchlorhydria, 13 hypochlorhydria, 5 achlorhydria and 4 achylia. Apparently only 20 were retested after presumed expulsion of parasites; of these 4 had been and remained normal; of 4 that had shown hyperchlorhydria 3 returned to normal or high normal and one persisted as such, 4 hypochlorhydrics showed improvement, 3 achlorhydrics showed acid after expulsion, and 5 were deemed pellagroid and remained without acid. In view of STEWART's work [*ante*, p. 389] the question of pepsin will no doubt be considered in future, for the investigation continues. C. L.

FAKHRY (A) **The Treatment of Schistosomiasis and Ankylostomiasis with Acriflavine.** [Correspondence.]—*Lancet*. 1934. July 21. pp. 162-163.

A preliminary note suggesting that acriflavine is useless against schistosomes but valuable against *Ancylostoma duodenale*.

Fakhry has treated 12 cases of schistosomiasis (11 *S. haematobium*, 1 *S. mansoni*) with acriflavine as advised by FISHER (see below) with benefit to symptoms but none to numbers and viability of ova when re-examination was made 3 days after the 5 daily doses ceased. By this time the urine has ceased to be coloured and presumably to be itself lethal to miracidia. Ten of the cases had also ancylostome eggs and in 8 of them eggs ceased to be found after the treatment; "so this gives a rate of 2 failures in 10 cases" [As LOOSS pointed out in Egypt, drugs, alcoholic excess and other changes in the worms' habitat cause oviposition of hookworms to cease for days. The results of re-examination after a stated and adequate interval will doubtless be reported when these preliminary experiments are repeated.] C. L.

CHOPRA (R. N.), GHOSH (N. N.) & MUKERJI (A. K.). **Anthelmintic Properties of *Vernonia anthelmintica* Willd. (Syn. *Serratula anthelmintica*)**—*Indian J. Med. Res.* 1934 July. Vol 22. No. 1. pp. 183-186.

Vernonia anthelmintica is a tall annual, N O Compositae, found throughout India.

The seeds contain.—

"(a) About 18 per cent. of a fixed oil, (2) about 0.02 per cent of an essential oil, (3) a bitter principle, and (4) resin, tannins, phlobaphenes, etc.

"(b) Powdered seeds in doses of 30 to 60 grains have a weak vermifugal action against ascaris and a more powerful action against oxyuris. The bitter substance isolated, in doses of 3 to 10 grains, has a weak vermifugal action against ascaris and a decided action against oxyuris. When combined with calomel and followed by magnesium sulphate the vermifugal action is considerably enhanced.

"(c) The drug has no action whatsoever against the hookworm and tapeworms

"(d) The anthelmintic properties of the drug against ascaris and even against oxyuris are weaker and in no way comparable with some of the other compounds now in the British Pharmacopoeia." C. L.

ISHII (Yoshio). **Studies on the Development of *Fasciolopsis buski*. Part I. Development of the Eggs outside the Host. Part II. Morphology and Biology of the Miracidium. Part III. Development in the Intermediate Host of *Fasciolopsis buski*, and Ekey-station of the Encysted Cercaria.**—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1934. Mar. Vol. 33. No. 3 (348). [In Japanese pp. 349-378. With 1 text fig. & 19 figs. on 1 folding plate. [65 refs.]; 379-390. With 6 figs. on 1 plate; 391-412. With 29 figs. on 1 folding plate. English summaries pp. 29-32.]

A closely detailed and finely illustrated study of the development of *F. buskii* from egg to encysted cercaria.

For the many details the papers or their English abstracts should be consulted. Of more general interest is the report that the secretion of the cephalic gland of the miracidium dissolves the adjacent surface

of the snail into a small conical hollow, whose margin forms the "penetration ring" which serves as a holding point for further entry. Mother rediae appear in about 14 days, daughter rediae have escaped from these in 25, mature cercariae have been found in 30 days and have left the snail in 31-35, all figures apparently holding for 28°C. The encysted cercaria is freed, not by mere action of gastric and intestinal juice, but by the mechanical stimulation and higher temperature of the definitive host's alimentary canal, assisted by the presence of bile.

C. L.

LIÈVRE (Henri). Les distomatoses à *Fasciola hepatica*. [*F hepatica* Infection in Algeria.] [Thesis for Doctorate of Medicine at University of Algiers. (1932. No. 22).]—291 pp. With 8 maps in text & 1 folding map. [472 refs.] 1932.

A valuable survey of the subject with special reference to the distribution of the infection in animals in Algeria, and with a survey of all cases, actual and problematic, which have been reported in man.

C. L.

SENEVET (G.) & LIÈVRE (H.) La distomatose hépatique à *Fasciola hepatica* [*F hepatica* Infection in Algeria.]—Reprinted from *Algérie Méd* 1933. Nov 7 pp. [23 refs.]

Seven cases of this infection have been reported from Algeria while an eighth probably became infected there. Diagnosis, symptoms, treatment and prevention are dealt with. The mortality is believed to be 38 per cent.

C. L.

BOSE (A. N.). Preliminary Report on a Rare Helminthic (Gastrodiscus) Infection in Man.—Reprinted from *Patna Jl of Med.* 1934. Jan. Vol. 9. No. 1. pp. 26a-26b.

Two inhabitants of a village in the Bhagalpore District, Bihar, India, passed between them, after carbon tetrachloride and oil of chenopodium, over 200 specimens of *Fasciolopsis buskin* and a few *Gastrodiscus hominis*. Apparently others in the village are infected with the former at least.

C. L.

BINFORD (Chapman H.). Clonorchiasis in Hawaii. Report of Cases in Natives of Hawaii.—*Public Health Rep.* 1934. May 18. Vol. 49. No. 20. pp. 602-604. With 1 plate.

Clonorchis ova were found in all stool specimens of 4 lepers examined as a matter of routine. None of these had been outside the Territory of Hawaii and all had lived on the Island of Maui at some time or other.

Up to 1927, aliens with clonorchis infection were excluded from Hawaii, the condition being classified as a "loathsome and contagious disease," but since it had not spread to man in the United States or Hawaii the regulation was then relaxed. As to the human infection, it is pointed out that large quantities of frozen, dried, salted and pickled fish are imported into these islands, that Cyprinidae are known harbourers of this infection, and that two of the four infected persons had eaten raw goldfish (which belong to this family) caught in the artificial taro ponds. As to operculated snails, there are three native species of Melaniidae and perhaps *M. hongkongiensis* is a host of the fluke.

C. L.

BAGCHI (K. N.). **The Incidence of Clonorchis Infection in India.**—*Indian Med. Gaz* 1934. June. Vol 69. No 6. pp 318–320.

The diagnosis is based on the study of eggs in the faeces. A stunted male of 23, looking about 13, suffered from enlarged liver and spleen with anaemia (r b.cs. 3,370,000, leucocytes 10,800, eosinophils 12, haemoglobin 45, colour index 0.67), irregular and intermittent fever, alternating constipation and diarrhoea, and a mild attack of jaundice a few months earlier. Used on 4 occasions D.C.F. showed no hookworm eggs, so that the possibility of this infection could safely be excluded, nor was there any evidence for malaria or kala azar. Brown operculated eggs were found on two out of four separate faecal examinations on different days and were very irregularly distributed in the faeces. Measurements of 3 eggs showed average dimensions of 27.6 by 15.9 μ . The eggs agreed in all respects with those obtained from a typical clonorchis case in Liverpool, and, although noting the difficulty in distinguishing them from those of heterophyes, Bagchi feels no hesitation in identifying the infection as clonorchis, presumably on the suggestive history and clinical findings. Since Indians seldom eat uncooked fish, the question is raised whether this infection, as well as that with *Fasciolopsis buskii*, might not be due to eating raw *Trapa bicornis* which is commonly peeled with the teeth. An editorial note dissents from the supposition that infection does not occur direct from fish and suggests that the evidence for clonorchis infection is not at all conclusive. C. L.

HOEPLI (R.). **Histological Changes in the Liver of Sixty-Six Chinese infected with Clonorchis sinensis.**—*Chinese Med. J.* 1933 Nov.–Dec. Vol. 47. Nos. 11 & 12. pp 1125–1141. With 10 figs. on 5 plates. [11 refs.]

This study brings yet another helminthic infection into the list of those in which, with symptoms absent or at most slight, the amount of bodily damage is indeed considerable.

In all 66 cases the infection was accidentally discovered at autopsy and had apparently in no case been the cause of death; which had for the most part been sudden and in 27 had not resulted from disease. For each of them there is provided a brief note of the cause of death and of the histological changes found. In all of them the larger bile ducts were dilated, and their walls thickened by new fibrous tissue which in 49 cases extended into the lobules. In 2 there was definite cirrhosis, in one constituting an exaggerated and advanced form of that present in the other cases, but in the other being Laennec's form. In a few there was dilatation and thickening of ducts too small for the flukes to have entered. Stress is laid on the adenomatous character of the epithelial proliferation present in the ducts and on the varying shapes of these cells. The liver cells showed fatty change in 20 cases. Cellular infiltration predominantly lymphocytic was the rule, in one case to the extent of forming lymphoid follicles with germinal centres. In 37 there were eosinophils in very varying numbers, and in 9 changes in the blood vessels—hyalinization of new fibrous tissue round central veins in 5, and increased fibrosis often with hyalinization of the arterial intima in 4. The reproduced microphotographs are excellent. C. L.

UYENO (Hiroshi) Ueber pathologisch-histologische Veränderungen der Kammchenmiere bei experimenteller Clonorchiasis sinensis [Changes in Rabbit Kidney in Experimental Clonorchiasis].—*Okayama-Igakkaï-Zasshi (Mitt d Med Gesellsch z Okayama)* 1934. Apr. Vol. 46 No. 4 pp. 794-801. [14 refs] [In Japanese. German summary p 793.]

In clonorchis-infected rabbits the splitting up of uric acid by the kidney is greatly lessened as compared with the condition in the uninfected.

C L

AMEEL (Donald J.). *Paragonimus, its Life History and Distribution in North America and its Taxonomy (Trematoda: Troglotreematidae).*—*Amer. Jl Hyg* 1934 Mar. Vol. 19. No 2 pp. 279-317 With 101 figs. on 6 plates. [42 refs]

The author summarizes thus :—

"All stages of the life history of the lung fluke of mammals in North America have been worked out in detail. The usual mammalian host is the mink. The second intermediate host is various species of crayfishes of the genus *Cambarus*. The snail host is *Pomatiopsis lapidaria*. All four generations in the snail have been reared in experimentally infected snails. The sporocyst and first generation redia of *Paragonimus* have been described in detail for the first time. The two redial generations have been distinguished on a structural basis. Hitherto undescribed morphological structures are reported for the miracidium, first and second generation rediae, unemerged cercaria, emerged cercaria and metacercaria. The knowledge concerning the distribution of the lung fluke of mammals in North America has been considerably enlarged. Sufficient evidence has been presented to indicate that the cuticular spines of the adult may not be good criteria for species differentiation. It has been suggested that characters more suitable for this purpose may be found in the life history stages but that, to be of value, it would be necessary to work out the life history in many endemic areas. The size of the gut in the second generation redia was pointed out as the one difference between the lung flukes of North America and Asia."

C L

NAGAYOSHI (K.). On the Present Incidence of Paragonimiasis in an Aborigines Village in Shinchiku Prefecture.—*Taiwan Igakkaï Zasshi (Jl. Med. Assoc. Formosa)*. 1934. Apr. Vol. 33 No 4 (349). [In Japanese. English summary p 56]

The present incidence of paragonimiasis in this endemic area in Formosa was 4 of 17 boys and 2 of 15 girls examined. The habit of eating raw crabs is still prevalent.

C. L.

SOUTH AFRICAN MEDICAL JOURNAL. 1934. May 12. Vol. 8. No. 9. pp. 319-325. A Symposium on Bilharziasis. I. Helminthology [MÖNNIG (H. O.)]. pp. 319-320; II. The Pathology of South African Bilharziasis [PIJPER (A.)]. pp. 320-321; III. The Signs and Symptoms of Bilharziasis [EPSTEIN (B.)]. pp. 321-323. IV. The Treatment of Bilharziasis [WRONSLY (W. H. Lloyd)]. p. 323; V. Bilharzia and the School [KIESER (J. A.)]. pp. 323-325; VI. Prevention of Urinary Bilharziasis in the Union [CLUVER (E. H.)]. p. 325.

MÖNNIG deals with the systematic position of the species and their development. As to *Schistosoma bovis* he cites the Iraq work of MacHATTIE and his collaborators and urges further work, particularly by infection of a snail with a single miracidium from man and another

with a single miracidium from an animal. Since only one sex results from one miracidium, animal experiments would shortly determine whether the two mated and produced fertile offspring. He suggests that "schistosomiasis" should take the place of "bilharziasis," because under the Rules of Zoological Nomenclature the parasites' valid name at the moment is *Schistosoma*. [But there is no reason why the nomenclature of disease should be changed because that of zoology alters. Trichinosis, for example, needs no modification]

PIJPER makes it clear that in South Africa he has never seen *S. mansoni*, but ova of *S. haematobium* are found in an ever increasing number of appendices submitted to the laboratory, and he raises this question—If there are symptoms of chronic appendicitis and the blood test reveals bilharzial infection, is it justifiable to substitute tartar emetic for operation? Similarly these eggs have been found in diseased tubes and even uteri. He notes that in these appendicular and tubal cases the urine has contained no ova. Reaction to the eggs may be intense, as evidenced in a case in which, with many ova, nearly the whole pelvis was filled with granulation tissue. In most adults the damage is held to amount to little more than a periodic loss of blood [but cf. BLACKIE, this *Bulletin*, Vol. 29, p. 401] though in children it is a grave matter and most local cases occur in the young. In diagnostic search of urine for ova it is advised to digest the centrifugal deposit with antiformin and again centrifuge; while the search of stool smears is usually fruitless so that some concentrative method has to be employed, Pijper preferring Telemann's. He has been using an antigen made from heavily infected urines "with reasonably good results," and reports a case with the ova in the sputum.

EPSTEIN uses the literature in describing the symptoms and he too stresses the frequency in South Africa of bilharzial appendicitis, acute and chronic in European and native.

WRONSLEY describes briefly treatment with tartar emetic, foudadin and emetine.

KIESER, a layman, gives a most valuable and graphic account of the effects of infection as seen in the school. As to the pupils it shows itself in 3 ways, in mentality, in physical retardation, and in stamina. His own words cannot be bettered:—

(a) *Mentality*.—"Johnny X comes to school at the age of 7 years, is a very promising and bright little boy, passes on very rapidly up to Standard II or III, and is generally placed among the first five scholars of his class until he becomes infected with Bilharzia. He then gradually becomes lazy, indolent, and his school-work deteriorates, and he drops several notches in the class, and probably scrapes through his Standard III by the skin of his teeth, but becomes a hopeless failure in Standard IV, to the great distress of his parents and his teachers. When such a case-history is presented to you, it is imperative to search for Bilharzia as a possible cause of the gradual retardation, even if there is no history of haematuria and the possibility of infection is denied. In all cases of this nature a cure of the bilharziasis has re-established the child on his previous pinnacle of eminence, to the great surprise of the teachers and sometimes—but seldom—to the gratitude of the parents."

(b) *Physical Retardation*.—"Boy over 10 years, still in grades; weight 46 lbs. Class teacher's report. 'He is too dull and lazy to do anything, he is not even naughty—just sits down wherever you put him and doesn't do anything.' Was injected and cured, and on re-examination three months later the following was found: (a) had gained 30 lbs. in weight, (b) was promoted to Standard I on merit, had become very active, and had already had several canings for naughtiness."

(c) *Loss of Stamina*.—"Boy of 15 nearly always fell out at cadet drill after about 10 minutes, complaining of all sorts of vague pains, and although he denied suffering from bilharziasis, his urine contained ova. He was injected and cured, later on gave no more trouble at drill."

The incidence of infection runs as high as 60 per cent. As to the teacher, here too the most striking aberration is loss of memory and inability to concentrate, and after cure he is apt to throw away as useless the notebooks he had to use while actively infected.

CLUVER, for prevention, lays most stress on treatment. Since an infected snail seldom lives for a year, cure, or alternatively prevention of promiscuous urination, would cut out further infection within about a year. The proper use of latrines will follow only after long education. A survey of water collections is necessary, with marking of all pools proved infective. Clean swimming pools must be provided. Suspected streams and pools must be cleared of vegetation to starve snails and stocked with trout or other snail-eating fish, and in them ducks and other snail-eating water fowl must be encouraged or protected. Chlorination does not kill cercariae, but for water of swimming pools a concentration of 1 lb. of copper sulphate in 100,000 gallons of water will do so within 48 hours.

A discussion followed in which ROSEMAN stressed HASLAM's report connecting irrigation with the spread of schistosomiasis (this *Bulletin*, Vol. 27, p. 173). C. L.

BULLETIN DE L'OFFICE INTERNATIONAL D'HYGIÈNE PUBLIQUE. 1934. May. Vol. 26. No 5. pp. 904-907.—Méthodes récentes à employer dans le problème de la bilharziose, avec remarques sur les régions irriguées de la province du Nil Bleu du Soudan Anglo-Egyptien. (Note du Dr. E. FRIDIE, communiquée au Comité permanent de l'Office International d'Hygiène publique, dans sa session d'octobre 1933, par M. le Dr. O. F. H. ATKEY.) [Schistosomiasis in the Irrigated Part of the Blue Nile Province, A.-E. Sudan.]

Recounts the large amount of success attending measures to protect and free the Gezira Province from bilharziasis.

The paper deals more precisely with and brings information to a later date than HUMPHREYS (this *Bulletin*, Vol. 30, p. 207). At the quarantine stations on the White Nile there were stopped between 1928 and 1932 over 14,000 persons. In the Province of Dongola during the same period the numbers examined yearly rose steadily from 12,203 to 49,007 while the percentages of infected were respectively 18, 12, 9, 4.6 and 5; examinations of school children from four different places show a like fall of infection. The indigenous population of the Gezira has over the same period shown infection figures of 0.46, 0.81, 0.21, 0.75, and 0.61. In it the protective measures have been provision of deep latrines, periodic drying and chemical disinfection of canals, and the provision of expert *Bulinus* hunters. C. L.

ZAVATTARI (Edoardo). Sulla grande frequenza della schistosomiasi vescicale nel Fezzan. [The Prevalence of Urinary Schistosomiasis in the Fezzan.]—Reprinted from *Boll. d. Soc. Med.-Chirurg. Pavia*. 1934. Vol. 12. No. 2. 11 pp. With 2 figs.

The author during a residence in the Fezzan, Tripolitania, set himself the task, first of examining as many pools of water as he could to

determine the presence of *Bulinus* (*Planorbis* and rectal schistosomiasis do not occur), and, second, of examining the inhabitants for infestation by *S. haematobium*.

Local details are given for *Bulinus* intensity, which varies from abundance to absence; and fluke infection has been proved for 60 to 80 per cent of boys in some localities and 15 to 20 per cent. of adults, though it, too, seems to be patchy.

H. H. S.

CAWSTON (F. G.) **The Control of Schistosomiasis in South Africa.**—*Jl. Roy. Army Med. Corps.* 1934. Aug. Vol. 63. No. 2. pp. 110–112.

When antimonium potassium tartrate was first introduced for intravenous injection it contained lead and other impurities. The consequent ill effects were attributed to the drug itself, it fell into disuse, and the sodium salt and foudadin, its sodium equivalent, were largely substituted though at the South African Institute for Veterinary Research the potassium salt and antimosan, its potassium equivalent, were retained in use. Cawston believes that the intravenous administration of the potassium salt should be confined to those able to administer it without undesirable local or general disorder. Nevertheless, high altitude seems to predispose to shoulder pain after injection. Treatment should aim at destroying the more resistant male parasite. There is no authority in the Union which is concerned with the control of *P. africana*, the usual local disseminator of schistosomiasis.

C. L.

ADAMS (A. R. D.). **Studies on Bilharzia in Mauritius. I. The Experimental Infection of *Bulinus* (*Pyrgophysa*) *forskali* with *Schistosoma haematobium***—*Ann. Trop. Med. & Parasit.* 1934. July 12. Vol. 28. No. 2. pp. 195–204. [15 refs.]

This would appear to be the first occasion in which *Bulinus* (*Pyrgophysa*) *forskali* has been shown conclusively to act as a host of *Schistosoma haematobium*.

Of all the Mauritian snails tested (and they included *Lymnaea mauritiana*, *Physa borbonica*, *Gyraulus mauritanus* and *Melanoidea tuberculata*), *B. (P.) forskali* was the only one vigorously attacked by the miracidia of *S. haematobium*. When the miracidia were numerous (10,000 to 20,000) the snails were literally covered with them and died with as many as 30 miracidia in a single low power field in sections subsequently made. All soft parts were penetrated, though no miracidia were observed in the tentacles. This snail, even when uninfected, could not be kept alive in a tank, but when a concrete open drain was used with a gentle current (conditions similar to those on which it lives naturally on the island), bifid-tailed cercariae began to emerge in 28 days from infected snails.

"In short, 100 *forskali* selected at random and dissected were all infested with characteristic sporocysts and cercariae; and in addition to these specimens actually dissected a large number of other snails of the same species were found to be emitting infective larvae. Dissection of about 50 specimens of each of the other species of snail exposed to the same treatment failed to reveal any such infestation. Control dissection of all types of snail had not shown the presence of the infection before the experiments had been commenced." The cercariae

had the morphological characters of the human schistosome cercariae. The wide distribution in Africa of this snail is pointed out and its omission from serious consideration in lists of possible intermediate hosts is commented upon. Animal experiments are in progress and will duly be reported
C. L.

DIAMANTIS (A). Le cancer bilharzien vésical. A propos de 11 cas personnels dont 2 cas de cancer bilharzien vésical non infecté. [**Bilharzial Cancer of the Bladder.**]—*Jl. Egyptian Med. Assoc.* 1934 June. Vol. 17. No. 6. pp 563-583. With 2 figs.

The conclusion reached is that with a bladder wall more or less filled with calcareous bilharzial deposits the irritation of a fresh infection produces cancer, so that this calcification has the same relation to vesical cancer as has leucoplasia to cancer of the tongue. The term "non infecté" appears to apply to bacteria
C. L.

EL DIWANY (Moh. Abdel Monem). The Bilharzial Appendix.—*Jl. Egyptian Med. Assoc.* 1934. Mar Vol 17. No. 3. pp 285-295. With 6 figs

"I am sure that one can find in the out-patients of any [? Egyptian] hospital hundreds of cases of chronic appendicitis for operation, if one takes the trouble to examine patients thoroughly"

Actually the author reports 25 cases of which 8 were negative to smear examination before operation, while after it "more thorough methods" displayed 3 more positives.
C. L.

ERSPAMER (Vittorio). Ricerche ematologiche sulla Schistosomiasi vescicale. (Ricerche compiute nel Fezzan.) [**Blood Researches in Vesical Schistosomiasis, Fezzan.**]—*Haematologica.* Pavia 1934 Vol 15. No 7. pp. 633-644. [24 refs.] French summary.

Twelve cases of bilharzial bladder were studied

Anaemia was inconstant and if present hypochromic or with normal haemoglobin value Leucocytosis was or was not present, but polymorphs were reduced at the expense of eosinophils and of mononuclears rather than of lymphocytes.
C. L.

FISHER (A. C.). The Treatment of Schistosomiasis with Acriflavine.—*Lancet.* 1934. Apr. 28. p. 897.

The results of acriflavine treatment in 52 intestinal cases were promising.

Having found that acriflavine was lethal in high dilutions to bilharzial cercariae in the presence of human blood serum, Fisher gave the drug to patients at Yakusu, Haut Congo Belge, by mouth (in all but the first two cases) in doses lessening relatively as weight increased, thus: 20 kg. or less, 0.02 gm. per kg.; to 30 kg. 0.015 gm. per kg.; 60 kg. 0.01 per kg. with a maximum dose of 0.7 gm. In 13, ova continued unchanged in the faeces; of these 11 were small children and received a dose of 0.012 gm. per kg. All the other 39 cases became symptom-free in less than 3 days, all ova passed after a week being degenerate. The longest observation period was 2 months. There have been no toxic symptoms or unpleasant sequelae. The parasite is described as being "of the *haematobium-bovis* group."
C. L.

CHRISTOPHERSON (J. B.) & WARD (R. Ogier) **Bilharzia Disease in England : the Cystoscopic Appearance of the Bilharzia Bladder before and after Intravenous Injections of Sodium Antimony Tartrate.**—Reprinted from *Brit Jl Surgery* 1934. Vol. 21. No. 84. pp. 632-636. With 2 coloured figs

A case of infection with *S. haematobium* acquired in Southern Rhodesia, and recognized and treated in England.

Treatment was by sodium antimony tartrate. Coloured figures of the cystoscopic appearances before and after this illustrate the condition. Christopherson's advice is to reach 2 grain doses in 4 days by daily administrations and thereafter to give 2 or 2½ grains on alternate days so that 28 to 30 grains may be reached in 4 or 5 weeks, the intention being that the flukes shall not become drug fast. Three points are stressed. After treatment small round yellow vesicles persisted, standing out on a normal vesical mucosa; they are believed to be due to dead ova. Eosinophilia may reach 70 per cent., it increases as injections persist, but if present after 3 months points to lack of cure. The distressing cough and discomfort in the throat and chest experienced immediately after an injection may be alleviated or abolished by giving ½ grain of omnopon intramuscularly 10 minutes before the antimony, and this may perhaps have been the reason that the man escaped the alarming muscular pains which may accompany tartrate injections.

C. L.

BRATIGNY (Jean) Contribution à l'étude des bilharzioses : leur importance en Afrique du Nord. [*Schistosomiasis, Particularly in N. Africa.*] [Thesis: University of Algiers.]—101 pp [17 pages of refs.]

A survey of general knowledge of schistosomiasis, with particular reference to North Africa

C. L.

FAUST (Ernest Carroll); HOFFMAN (William A.); JONES (Charles A.). **Life History of Manson's Blood Fluke (*Schistosoma mansoni*).** I. Extramammalian Phase of the Cycle [FAUST & HOFFMAN].—*Proc. Soc. Experim. Biol. & Med.* 1934. Jan. Vol. 31. No. 4. pp. 474-476. II. The Mammalian Phase of the Cycle [FAUST, JONES & HOFFMAN].—*Ibid.* pp. 476-478; III. The Blood Picture in *Schistosomiasis mansoni* [FAUST & JONES].—*Ibid.* pp. 478-479.

The findings of these summarized researches are indicated by the titles. They took place in Porto Rico.

I. Egg numbers vary day by day as well as with the age of the infection. Hatching of a mature miracidium is influenced by its vitality, by toxicity of the medium and by agitation, and usually requires 12 to 24 hours after washing the stool. The miracidia then live for not over, usually for considerably less than, 24 hours in the top inch of the water. Of *Helisoma (Planorbina) guadaloupense* exposed to infection by them, 75 to 100 per cent. become infected. Primary sporocysts were first identified on the eighth day. Cercariae begin to emerge in from 24 to 35 days according to season, continue to do so for 4 months with greatest daily discharge at about 2 months, and about 100,000 are so produced from a single miracidium. The infection makes the snail unusually liable to die from other causes. The cercariae emerge commonly between 9 a.m. and 1 p.m. and are uniformly

distributed through the water in 8-10 hours; after 18-24 hours they usually crawl about the bottom, they avoid cold but are capable of surviving for at least 24 hours at a temperature just above freezing, and are then activated on raising it to 22°-30°C. They have two pairs of anterior secretory (penetration) glands with large dense granules, and four pairs of posterior secretory glands with fine granules. In a small percentage of specimens freshly emerged from the snail, evidence of a head gland has been found.

II. In Porto Rico man is the only known definitive host. The methods of research are stated. With important exceptions the lines of development are those already described. Within 16-20 hours the cercariae have left the skin of experimental animals. They reach the right heart mainly by veins, to some extent by lymphatics having passed through the lymph nodes, and are found in the lung capillaries in 20 hours. By the third day they have reached the systematic circulation and by the fourth the portal branches within the liver where, it is believed, they feed for the first time. The fact that fed larvae are found in the lungs up to the 19th day is evidently held as evidence that they have returned to the right heart from the liver. The conception is that of a series of passive conveyances of larvae by the blood circulation through the various organs but with an accumulation in the liver about the 13th day. In no single instance was there evidence of direct active migration of larvae from pulmonary vessels to liver. As compared to *S. japonicum*, *S. mansoni* has a lag of 5 to 10 days. Some individuals are mature in 35 to 40 days. The habitat is the colonic venules. There is usually only one egg in the uterus, but 8 per cent. of 355 females had three. Yet from egg counts in the mucosa each female is believed to lay several tens of eggs daily, only a small fraction being evacuated with the faeces.

III. While the pulmonary circuit is occurring there is a leucocytosis. In the latent period there is a leucopenia and if there is eosinophilia it occurs at its end. From about the 40th day the plasma holds excess of euglobulin. "Moderate to late clinical cases usually give a positive precipitation test for serum globulin." Erythrocyte numbers are little altered but are evidently being formed in excess, as evidenced by hyperplastic bone marrow and reticulocytosis. C. L.

HOFFMAN (William A.) & FAUST (Ernest Carroll). *Studies on Schistosomiasis mansoni in Puerto Rico. II. The Epidemiology and Geographical Distribution of Schistosomiasis mansoni in Puerto Rico. I. Epidemiology of the Infection on the Island.—Puerto Rico J. of Public Health & Trop. Med.* 1934. Mar. Vol. 9. No. 3. pp. 228-254. With 1 text fig. & 12 figs. (1 map) on 7 plates. [10 refs.] [Spanish version pp. 255-282.]

Here are considered the geography and climate of Porto Rico, its chief agricultural product (sugar cane), methods of obtaining local epidemiological data, known foci, and the habits of intermediate and definitive hosts which favour infection.

The smear does not reveal this infection with certainty and to do so reliance seems to have been placed on straining with gravity precipitation (see below), though FAUST states that he has employed straining and centrifugal precipitation. In diagnosis stress is laid throughout on a history of piquiña, or intense itching, as serving to display those waters immersion of the skin in which has permitted

cercariae of this fluke to penetrate it [The reviewer suggests that an unhesitating assumption that piquña means penetration of schistosome cercariae is unwise in view of the production of intense bathing rashes by other cercariae in the United States and in Europe (CORT, this *Bulletin*, Vol. 25, p. 946; CHRISTENSON & GREENE, Vol. 27, p. 459, MATHESON; MATHIAS; VOGEL; TAYLOR & BAYLIS, Vol. 27, pp. 960 & 961) and by hookworms in Porto Rico itself (ASHFORD, PAYNE & PAYNE, *ante*, pp. 122 & 391.)]

The intermediate host, *Helisoma (Planorbina) guadaloupense*, has been studied with avowed incompleteness as to habits and habitat, but the following considerations are believed to hold good. There is a decided preference for quiet water, though the snails have been observed to move against a moderately strong current, they are, then, adaptable creatures. In places where they thrive the water has always been alkaline with pH of 7.2 to 7.8; they have been found in water so brackish as to taste salty; and they flourish in limestone pools where many reach the maximum diameter of the species, namely 1.25 in., but it is noteworthy that in these "limestone sinks" no infected snails have ever been found. Drying is harmful to these snails although the matter has not been measured in terms of time, nor is it known whether they can save themselves by burrowing into mud. Heavy rain will wash them away either to destruction or to some quiet overflow pool where they may spread infection. *H. guadaloupense* is far wider spread than is human schistosomiasis, so that the slow spread of the disease which is believed to be taking place in Porto Rico is likely to continue, but on the other hand the disease is present where none of these snails has been found; yet when they have been found it has sometimes been in quite unexpected spots. Promiscuous defaecation is a main factor in spreading infection to snails, but sewage is run into streams or directly on to cane fields. Cercariae enter man when he is bathing, washing clothes (though a swift current and soap seem to be deterrents), wading, fishing, and working as at irrigation ditches for the cane. A girl under 2 years old was the youngest infected person found, a local infection of 60 per cent. was discovered, and a good social status does not protect children who swim in infected waters. The paper also contains much of purely local interest.

C L.

HOFFMAN (W. A.), PONS (J. A.) & JANER (J. L.). **The Sedimentation-Concentration Method in Schistosomiasis mansonii.**—*Puerto Rico Jl. of Public Health & Trop. Med.* 1934. Mar. Vol. 9. No. 3. pp. 283-291. [Spanish version pp. 292-298.]

Since Mansonian schistosomiasis is of importance in Porto Rico, and since the usual faecal smear does not display all infections, the authors have devised and evaluated a concentrative method which uses straining and gravity precipitation.

Experience has resulted in alteration in detail but the method now advised seems to be as follows. 1 gm. of faeces is softened in 2 oz. of water for 15 to 20 minutes. If the water is tap water it should first have been allowed to stand until bubbles have formed and broken. The faeces are then comminuted and the suspension strained rapidly through an 80 to 100 mesh sieve or several thicknesses of cheesecloth. It is then left to sediment, apparently for as long as is judged necessary, in a conical urine glass, it being noted [as for hookworm eggs and larvae] that ova are apt to come to rest on its sloping sides, but may be

induced to continue their way to the point of the cone by tapping the flask or, it is stated, by gentle stirring of its contents. To enable a Stoll's pipette to reach the bottom of the vase half the vessel's contents are carefully decanted, or a long conical pipette may be used. From the bottom of the glass 0.075 cc is removed, placed on a slide, covered with a square 22 mm. cover and the eggs counted. Comparative counts of 35 smears and 35 of these preparations showed an average of 30 times as many ova from the latter as from the former, the figures varying from 1 to 1, to 0 to 204. To take 0.075 cc from the sediment does not exhaust the eggs. The technique differs from that advised by STOLL in that water is used instead of decinormal caustic soda. "This chemical [which dissolves chitinous] at times seemed to adversely affect schistosome ova. The number of eggs recovered, as a rule, did not exceed those found on smear preparations. . . . Therefore it appears that the Stoll count possesses no appreciable advantage over the smear." Eggs began to lessen after the 4th injection of foudin, but the ratio of dead to viable eggs appeared to remain unchanged, suggesting that the drug acts not on the eggs but on the mother worm. These tests must not be considered exactly quantitative, it is noted, for undoubtedly the point of the pipette does not always sample the part of the sediment which is richest in eggs.

[The authors first believed that sedimentation had not yet been used for schistosome eggs, but later found some references. They add "The procedure of Helmy apparently bears some similarity to that developed by the present authors, but owing to the inaccessibility of his publication, a detailed comparison cannot be made." TOMB and HELMY gave particulars of such a method in the *Trans. Roy. Soc. Trop. Med. & Hyg.*, 1931 Vol. 25, p. 181, and in the last list of "Exchanges" of that Society appears the *Puerto Rico Journal of Public Health & Tropical Medicine*. The paper itself was abstracted in this *Bulletin*, Vol. 29, p. 410.] C. L.

LUTZ (Adolpho). Transmission du *Schistosoma mansoni* dans l'État de Minas Geraes (Brésil) par le *Planorbis centimetralis*. [Transmission of *S. mansoni* by *P. centimetralis* in Brazil.]—*C. R. Soc. Biol.* 1934 Vol. 116. No. 26. pp. 1149-1150.

This short note, presumably a preliminary one, states that Lutz has observed miracidia hatching from the eggs of *S. mansoni* and infecting the small *Planorbis centimetralis* which is apt to escape attention among the much larger *P. olivaceus*. Some of these have survived long enough for the formation of cercariae and one of them has actually furnished cercariae which have infected 3 white mice, all the worms being males in the two hosts examined. C. L.

LEGENDRE (F. M. A.) & RAZAFINJATO. Note sur quelques cas de bilharziose à *Schistosomum mansoni*. [Cases of Rectal Schistosomiasis (Madagascar).]—*Bull. Soc. Path. Exot.* 1934 Apr. 11 Vol. 27. No. 4. pp. 398-400.

Eight cases are published as a reminder that particularly about Ambo-sitra (Madagascar) this infection is present, and that in enteritis and dysentery the stools should be examined and an adequate course of tartar emetic given if necessary. C. L.

HUAI-CHIEH (Kan) & YUNG-TSUNG (Yao) **Some Notes on the Anti-Schistosomiasis Japonica Campaign in Chih-Huai-Pan, Kaihua, Chekiang.**—*Chinese Med. J.* 1934 Apr. Vol. 48 No. 4. pp. 323-336. [19 refs.]

This report has been issued before most of the patients had received a full course of treatment. Diagnosis and prevention are more adequately considered.

In diagnosis the smear, Tomb and Helmy's sedimentation method [this *Bulletin*, Vol. 29, p. 410], and Faust and Meleney's concentration method [this *Bulletin*, Vol. 22, p. 468] were compared and as a result the smear gave the highest incidence. But at least 8 smears were examined. [The conclusion emerges that these particular concentration methods result in marked loss of ova.] Local infective rates of oncomelania snails lay between 2.1 and 3.7 per cent., and experiments suggested that as a habitat they preferred weak faecal emulsion to grass infusion or to plain water. Local prophylactic measures are suggested. As to treatment, 22 had completed a course with foudadin, none with sodium antimony tartrate and 2 with emetine. Preference is given to foudadin with a cure rate of 68 per cent. C. L.

BHALERAO (G. D.) **On the Occurrence of *Schistosoma japonicum* Katsurada in India.**—*Indian J. Vet. Sci. & Animal Husbandry*. 1934. June. Vol. 4. Pt. 2. pp. 148-151. With 1 fig.

Some 6 male schistosomes obtained by MAPLESTONE from the intestine of a pig in Calcutta and received in a poor state of preservation are identified as *S. japonicum* and with this is correlated the report by SEWELL (*Records Indian Museum*. 1919, Vol. 16, p. 425) of cercariae resembling those of this fluke in *Indo-planorbis exustus* and *Limnaea amygdalum* from the same locality. It is held likely that future investigation will reveal this parasite in man. C. L.

LEE (C. U.) & CHUNG (Huei-lan). **Treatment of Schistosomiasis Japonica with Foudadin in Man.**—*Chinese Med. J.* 1933. Nov.-Dec. Vol. 47. Nos. 11 & 12. pp. 1411-1420. [16 refs.]

Foudadin did not prove successful in Japanese schistosomiasis.

Four cases were treated. A boy of 11 derived no apparent benefit after 31 cc. in 14 days. The others, all adults, showed temporary improvement, with relapse in a non-endemic area; one received 31.5 cc. on 18 days when the drug had to be stopped on account of fever, headache, nausea, vomiting and prostration; another had 2 courses of 40.5 cc. and 45 cc. within 2 months; the last received 44.5 cc. intramuscularly in 18 days. C. L.

BROWNE (J. A.). **Notes on a Case of Schistosomiasis Japonica treated with "Foudadin."**—*Jl. Roy. Nav. Med. Serv.* 1934. Apr. Vol. 20 No. 2. pp. 182-183.

After 6 courses of foudadin—of 45 cc. for the first and apparently for the others—this officer was judged to have been cured. The infection was obtained while snipe shooting in spite of his going out smeared with carbolyzed vaseline and scrubbing himself with strong Iysol on his return.

C. L.

CHUNG (Huei-lan). **Certain Surgical Complications of Schistosomiasis japonica.**—*Chinese Med. J.* 1933 Nov-Dec Vol 47 Nos. 11 & 12 pp 1171-1180 With 2 plates [14 refs.]

In these 4 cases, Japonic schistosomiasis was not suspected. The conditions calling for surgical interference were: mesenteric thrombus, retroperitoneal abscess, acute appendicitis with abscess, and tuberculosis of intestine and lungs
C. L.

SONODA (Taro). Experimentelle Untersuchung ueber den Einfluss des Ikterus auf die Entwicklung von *Schistosoma japonicum* im Wirtskorper. (II. Mitteilung.) [**Influence of Jaundice in the Host on Development of *S japonicum*.**—*Trans Soc. Path. Japon.* 1933. Vol. 23. pp. 820-822.

The development of *S japonicum* is hindered in jaundiced rabbits at least in its later stages. In early jaundice the worms can come to full development.
C. L.

WATANABE (Masumi). Ueber die Embryonalentwicklung von *Schistosoma japonicum* [**Embryonic Development of *S. japonicum*.**—*Okayama-Igakkai-Zasshi (Mitt. d. Med. Gesellsch. z Okayama).* 1934. Mar. Vol. 46. No. 3. pp 617-664. With 26 figs. on 5 plates & 5 text figs. [29 refs.] [In Japanese. German summary pp. 615-617.]

Watanabe describes in detail the development of *S japonicum* from the single cell to the miracidium.
C. L.

MEGGITT (F. J.). **The Theory of Host Specificity as applied to Cestodes.**—*Ann. Trop. Med. & Parasit.* 1934. Mar. 29. Vol. 28. No. 1 pp. 99-105. [38 refs.]

Meggitt deals with an extension of the idea of the setting up of species, in this instance cestode species, on physiological grounds—namely the suggestion of FUHRMANN that any species to be a species must be limited to a single group of hosts. *Dipylidium caninum* or *Hymenolepis diminuta* would not, that is, be of the same species in man and in dog or rodent.

It is pointed out that there are two courses open. Either the anatomy is the deciding factor, or no identification of a worm is possible without knowing the host it came from. It is held that "the only safe procedure is to proceed to identification solely on the basis of the anatomy of the specimens . . . irrespective of the systematic position of the host."

[When the progeny of *Ancylostoma braziliense* from a cat in Brazil successively infect a sailor, a pariah dog in Colombo and a coolie on a Ceylon tea garden, what is their valid name at each stage if Meggitt's advice is thrown out?] C. L.

SOKOLOVSKI (W.). [**Transduodenal Expulsion of Cestodes with Quinine.**—*Milit. Med. Ztschr.* Leningrad. 1933. Vol. 4. No. 4. pp. 274-276. [In Russian.]

The author obtained excellent results in the expulsion of cestodes with quinine [? hydrochloride] administered through the duodenal sound, in dose of 1 gm. in 10 per cent. alcoholic solution, followed 5 minutes later by administration of 15 cc. of a 25 per cent. solution of magnesium sulphate. This method was tested in 11 cases (9 T.

saginata, 1 *T. solium*, 1 *D. latum*) and was successful in 10, the worms having been expelled together with the scolices within 30–60 minutes. In the majority of the cases treated with quinine previous treatment with male fern was ineffective

C A Hoare

BRANSBURG (M.), GORELIK (S) & SCHICHOBALOWA (N.) Prüfung des Filicilens—eines neuen Mittels zur Behandlung der Zestodosen beim Menschen [Trial of Filicilen for Treatment of Cestodes.]—*Med. Parasit. & Parasitic Dis* Moscow. 1933 Vol. 2. Nos. 4–5. pp. 317–322 [In Russian. German summary p 322]

“ Filicilen ” was tested on 171 cases of cestode infection and proved to be effective in about 90 per cent. of infections with *T. saginata*, *T. solium*, and *D. latum*. The advantages of the new drug are its solubility in water and oil, its laxative properties and relative non-toxicity. This new anthelmintic is prepared from the extract of male fern and contains all its active principles without the ballast substances. The drug is made up either in powder form (1 part of which is equivalent to 2 parts of male fern extract), or dissolved in castor oil (1 part of the solution being equivalent to 1 part of male fern extract)

C A Hoare

MITTELMANN (G.). Zestodosen-Behandlung mit Cucurbita-Samen. [Treatment of Cestode Infestation with Pumpkin Seeds.]—*Med. Parasit. & Parasitic Dis* Moscow. 1933 Vol. 2. No. 3. pp. 143–146. [In Russian. German summary p. 146.]

The treatment with pumpkin seeds resulted in the expulsion of the parasites in at least 55 per cent. of cases. It is recommended for its simplicity, cheapness and perfect harmlessness.

C. A. Hoare.

JOYEUX (C.), HOUDEMER (E.) & BAER (J.) Recherches sur la biologie des *Sparganum* et l'étiologie de la sparganose oculaire. [The Biology of Sparganum and the Etiology of Ocular Sparganosis.]—*Bull. Soc. Path. Exot.* 1934. Jan. 10. Vol. 27. No 1. pp. 70–78. With 1 fig.

Since it is difficult to distinguish between the strobiles of *Dibothriocephalus mansoni* and *D. erinacei europaei*, the authors have attempted to discover differences in their development.

Their investigation started with the assumption that plerocercoids harboured by the snake *Tropidonotus natrix persa* of Italy will be those of *D. erinacei europaei*, while those harboured by *Tropidonotus piscator quinconciatus* of Indo-China will be of *D. mansoni*; and their conclusion is that the former develops easily in batrachians but does not develop in reptiles and mammals. In those cases in which parallel experiments were made the tables show, however, that for *Rana esculenta* the respective figures for the two forms were 8 of ten, and “ about half ”; for *Hyla arborea* 2 of 3, and “ about half ”; for *Testudo ibera* 2 of 4, and “ nearly all ”; for the white rat 1 in 5, and 1 in 6 or 8; for the guineapig 1 in 7, and 0 in 6 or 8; for the rabbit 1 in 2, and 0 in 6 or 8; and for the cat and dog negative results in both. Ocular sparganosis of the Far East is, the authors note, a matter of frog poultices and not of tapeworm species, for they have obtained identical experimental results by placing in the conjunctival sac the plerocercoids of both forms and those of *D.*

latum. Mention is made of 6 species into which FAUST and his colleagues divided *S. mansoni* in which connexion the findings of IWATA (below) should be taken into consideration. C. L.

IWATA (Seishun) **Some Experimental and Morphological Studies on the Post-Embryonal Development of Manson's Tapeworm *Diphyllobothrium erinacei* (Rudolphi).**—Reprinted from *Japanese Jl. Zool.* 1933 Oct. 20 Vol 5. No. 2. pp. 209-247 With 54 figs. (14 on 4 plates). [60 refs.]

MEGGITT, FAUST and others have divided Manson's tapeworm into 7 species. Iwata's investigations show but one.

One and the same strobile showed proglottids corresponding in morphology to the seven different "species"—namely from the scolex caudad in regular sequence *D. reptans*, *D. okumurai*, *D. mansoni*, *D. ranarum*, *D. mansoni* (reappearance), *D. decipiens*, *D. houghtoni*, *D. erinacei*. There is then one species only, and since *D. erinacei* (Rudolphi, 1819) was the first of these names to be given, it is the valid name under the International Code of Zoological Nomenclature. The same conclusion follows feeding experiments, for the same adult worm has grown from plerocercoids obtained from frog, snake, weasel, hedgehog and man. C. L.

TARASSOW (Wictor). **Das Schwein und der Hund als endgültige Träger des *Diphyllobothrium latum*.** (Eine experimentelle Untersuchung.) [**Pig and Dog as Definitive Hosts of *D. latum*.**]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934. Apr. Vol. 38 No. 4. pp. 156-159.

Pig and dog are definitive hosts of *D. latum* and may be so to an extent important in hygiene.

Contrary to the experience of MAGATH and ESSEX (this *Bulletin*, Vol. 29, p. 49) that only 1.5 per cent. of eggs of *D. latum* from the dog develop active coracidia Tarassow has found that 50 per cent. do so. Certainly development is slower than in the case of eggs from man, for in these about three-quarters were found developed to that stage from the 16th day onwards, whereas in those from the dog only 7.8 to 9.2 were so developed on the 16th day, but 50 to 52.1 per cent. showed coracidia on the twenty-fifth day. In these circumstances it is impossible to neglect the dog in any campaign against this parasite. Further Tarassow fed six plerocercoids from the pike to a pig of 1½ months old, and another of 35 days and took 6 himself. The numbers of strobiles which developed were two in each instance. Further he investigated 2 to 6 swine in each of 4 villages and found infection percentages of 100, 83, 33 and 0, the last being one in which fish did not form an article of food, so that the swine ate no fish offal. C. L.

SCHWENNICKÉ (Helmuth). **Ein besonderer Fall von *Bothriocephalus latus*-Intoxikation.** [**Case of *D. latum* Infestation.**]—*Muench. Med. Woch.* 1934. Jan. 19. Vol. 81. No. 3. pp 96-97.

A woman of 53 with abdominal pain and distension and with vomiting and subicteric tinge of the skin and conjunctivae was sent into hospital for biliary colic. Expectant treatment was adopted and, a stool examination on the 13th day having disclosed "worm eggs," male fern produced about 8 metres of tapeworm with return to health and loss of the yellow tinge,

which had, however, never appeared in the urine. There was no eosinophilia, the leucocytes numbered 11,300. Such attacks had come on quarterly for 4 years. C. L.

YOSHINO (K.). On the Subjective Symptoms caused by the Parasitism of *Taenia solium* and its Development in Man.—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1934. Jan. Vol. 33. No. 1 (346). [In Japanese pp 183–194. [16 refs.] English summary pp. 14–15.]

Yoshino swallowed 3 *Cysticercus cellulosae* and noted the following occurrences over about 2 years and 3 months. Either 2 or 3 strobiles grew. After reaching maturity, which in Japanese and Chinese takes 62 to 72 days, the number of gravid segments passed was 334 in the first month, 174 in the sixth, and 126 in the twelfth. This number therefore is no index of the number of worms harboured. The subjective symptoms vary with individual and worm load, a healthy man having few, and these being gastro-intestinal and more marked early. C. L.

YOSHINO (K.). On the Evacuation of Eggs from the Detached Gravid Proglottids of *Taenia solium* and on the Structure of its Eggs.—*Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa)*. 1934. Jan. Vol. 33. No. 1 (346). pp. 47–58. With 8 figs. on 1 plate [11 refs.] [In Japanese. English summary pp. 3–4.]

As the detached proglottid creeps about eggs are discharged from its anterior end, the average number so discharged being 40,436, while 876 remain. If discharged in water the eggs are complete, if not the onchosphere is naked. A detailed description with measurements follows. The hooks number 6 to 18. C. L.

ANDERSON (Marlowe G.) The Validity of *Taenia confusa* Ward, 1896.—*Jl. Parasitology*. 1934. June. Vol. 20. No. 4. pp. 207–218. With 34 figs. on 4 plates. [10 refs.]

The conclusion is that the name *Taenia confusa* lapses as a synonym of *T. saginata*.

The basis of the investigation is the following quotation from PARKER and HASWELL'S Text Book of Zoology :—

" . . . the only criterion of a 'good species' is usually the presence of constant differences from allied species. . . . If there are no intermediate gradations between two sets of individuals, they will be placed without hesitation in distinct species: if, on the other hand, there is a complete series of gradations between them they will be considered to form a single variable species."

Since the descriptions of the four specimens of *T. confusa* are in many respects similar to those of *T. saginata*, Anderson examined 41 well preserved specimens of the latter. The ranges of variation in shape and size of organs and structures are tabulated, described and figured, and they include all the characters which have been described as specific for *T. confusa*, with a complete series of intergrading forms. There are not, then, two species. Anderson must be congratulated on a fine piece of laborious work. C. L.

DÉVÉ (F.). "L'anatoxine hydatique" de Ymaz Apphatie ne possède pas de propriétés curatives à l'égard de l'échinococcose expérimentale [*The Hydatid Anatoxin of Apphatie not Curative.*]—*C. R. Soc. Biol.* 1934 Vol 115. No 9 pp. 954-956.

In 1932 APPHATIE reported the production of hydatid anatoxin by formalization of hydatid fluid at 39°C. for 1 month. Repeated injections of anatoxin in sufficient dosage were regarded as possessing immunizing powers and, in the case of two patients harbouring hydatid cysts, retrogressive changes, which were verified microscopically, were described as resulting from such inoculations. [See this *Bulletin*, Vol. 30, p 681.]

The present paper deals with a few experimental observations on this subject. In the first experiment two mice were injected with the hydatid scolices derived from ovine sources. Six months later both animals received 14 injections of anatoxin, but subsequently at autopsy healthy cysts were found. Some 3 weeks after scolices had been inoculated into three other mice, injections of anatoxin were begun, a total of 13.2, 11.4 and 11.6 cc. being given. Four months later normally developing cysts were found. Similar results were obtained with experimentally infected rabbits.

Dévé concludes that his experimental results were entirely negative, and that the changes noted in cysts at operation on man by APPHATIE were a coincidence and not causally related to anatoxin inoculation.

N. Hamilton Farley.

DÉVÉ (F.). Essai d'immunisation anti-échinococcique par injections sous-cutanées de membranes hydatiques broyées à l'état frais [*Attempt to immunize against Hydatid by Injection of Pulverized Hydatid Membrane.*]—*C. R. Soc. Biol.* 1934. Vol. 115. No. 10 pp 1025-1026.

In 4 white mice and 2 rabbits injections of pulverized fresh hydatid membrane had no effect in preventing or curing hydatid infection. C. L.

CH'IN (Kuang-yu). **Nodules or Tumors in Subcutaneous and Other Tissues due to *Cysticercus cellulosae*.**—*Chinese Med. J.* 1933. Nov.-Dec. Vol. 47 Nos. 11 & 12. pp. 1181-1190. With 8 figs. on 4 plates.

A brief clinico-pathological note on 13 cases of *C. cellulosae*.

They occurred among 26,300 surgical specimens received in the pathological laboratory of the Peiping Union Medical College. The clinical diagnoses were: neurofibroma 4, sebaceous cyst 1, fibroma 1, lipoma 1, ganglion of biceps tendon 1, tumour of muscle 1, brain tumour 1, ? disorder of reticular system 1, cysticercus 2. The sites from which the tumours were removed were: subcutaneous tissue 8, muscle 3, brain 1, submucous layer of lip 1; nevertheless there were epileptic symptoms in 5. The microscopic appearances of cysts and tissues are described as well as symptoms, signs, and geographical distribution. As to the mode of infection, none admitted eating raw or underdone pork. Two harboured tapeworms. Of the other 11, stool examinations were made in 8 and were negative; and none of them, all men of education and intelligence, had ever noticed passing anything like a tapeworm. Accordingly it is suggested that they

swallowed the onchospheres deposited on vegetables or fruit, in confirmation of which it is noted that they were also passing ascaris ova and amoebic cysts.

C. L.

TULL (J. C.) & SUBRAHMANYAM (C.). **A Case of *Cysticercus cellulosae* of the Brain.**—*Trans Roy Soc. Trop. Med & Hyg* 1934. Aug. 4. Vol 28. No 2 pp. 165-166.

A case published because of the rarity of the worm, adult or larval, in Singapore.

Of 894,316 carcasses of pigs examined, 3,630 have been condemned for cysticercus infection; stool examinations of 118,723 persons have disclosed *Taenia solium* in 6 only, in 1,178 complete autopsies only one example of *Cysticercus cellulosae* has been found. The man now reported on had been admitted for prolapsed piles, but had suffered for 3 years from increasingly frequent epileptiform fits with loss of consciousness. His stools showed no ova nor segments of *T. solium*. His temperature suddenly rose to 104°F. with twitchings and aphasia. After death numerous dead uncalcified cysticercal cysts were found on and in the cerebrum and one in the cerebellum.

C. L.

- i. MARSH (E. B.). **An Interesting Case of Cysticercosis.**—*Jl. Roy Army Med Corps.* 1934. Apr. Vol 62. No. 4. pp. 294-296.
- ii. HOLMES (F.). **Notes on a Case of Cysticercosis.**—*Ibid* pp. 296-298.

i. Cysticerci limited to the brain

Marsh has seen 10 cases of cysticercosis invalided for epilepsy within 18 months. Headache, fever, insanity and stupor, with double optic neuritis but no vomiting, were the cardinal symptoms of this case. At autopsy, very many cysticerci throughout and over both hemispheres with a few in the mid-brain constituted the parasitic findings, with no strobilus, nor was there a history of one.

ii. Holmes's case had passed segments for 3 years, and under *Felix* passed a *T. solium*. He was a dispatch rider with temporary disorientation of time and space followed by epileptic fits, in which the tongue was bitten, and accompanied by subcutaneous nodules shown to be caused by *Cysticercus cellulosae*.

C. L.

DIXON (H. B. F.) & SMITHERS (D. W.). **A Case of Cysticercosis (*T. solium*) with Well-Marked Optic Neuritis.**—*Jl. Roy Army Med. Corps.* 1934. June. Vol. 62. No. 6. pp. 426-430.

The now usual history of service in India and epileptic fits, with optic neuritis beginning when in the Army in June 1931.

A Board in February 1933 reported no subcutaneous nodules; at one in 1934 it was found that 28 had appeared. The optic neuritis had practically disappeared leaving secondary atrophy without lessening of the fields.

C. L.

- i. DENNY-BROWN (D.). **Cerebral Cysticercosis with Epilepsy.**—*Proc. Roy. Soc. Med.* 1934. Apr. Vol. 27. No. 6. pp. 667-668 (Sect. of Neurology pp. 19-20).
- ii. BEHRMAN (S.). **Cysticercosis.**—*Ibid.* pp. 668-669 (Sect. of Neurology pp. 20-21). With 1 fig.

Both men had been in India and suffered from fits.

i. X-rays showed calcified cysts above the tentorium, very numerous, superficial and deep, up to the size of a pin's head, but none elsewhere. Pallor of both discs.

11. He had harboured a tapeworm, as had two other soldiers in the same regiment who also had subsequent fits. There were numerous calcified cysts in muscles (some shown in a reproduced skiagram) and brain

C L.

DUDLEY (Sheldon F) **Tape Worm Cysticercus Epilepsy as illustrated by a Case in a Naval Rating.**—*Jl Roy Nav Med Serv* 1934 Apr Vol 20 No 2 pp 179-181.

The case of a naval rating is used to bring MACARTHUR's experience in the Army to the notice of Naval surgeons

A man of 40 had his first fit at Hong Kong after 20 years service and passed tapeworm segments on the way home. *T solium* was evacuated at the R N hospital, X-rays showed calcified cysts about elbow and legs, and the type of seizure was very variable

C L

HOEPLI (R) & FENG (L C) **Myeloid Changes in the Spleen of Experimental Animals due to Infection with *Cysticercus fasciolaris* and to Emulsions prepared from Tapeworms.**—*Chinese Med. Jl* 1933 Nov-Dec Vol. 47. Nos 11 & 12 pp 1146-1153 With 3 figs. on 2 plates

Definite myeloid changes in the spleen may be obtained by infection of rats and mice with *C. fasciolaris* and by injecting emulsions of *C fasciolaris*, *Taenia taeniaeformis* (the former's strobile) and *T marginata*

The authors have found in the literature no reference to any influence of *C. fasciolaris* on it. Hamsters are largely, or perhaps entirely, immune to this change.

C L.

BRUMPT (E.), DUVOIR (M. E.) & SAINTON (J.). Un cas de cénurose humaine dû au "*Coenurus serialis*" parasite habituel des lapins et des lièvres. [Case of Human Coenurosis due to *C. serialis* of Hares and Rabbits.]—*Bull. Acad. Méd* 1934. July 10 98th Year 3rd Ser Vol 112. No. 26 pp. 58-67 With 5 figs [15 refs.]

The specific identification of *Coenurus serialis* is based on the morphology of the scolex, the habitat, and the presence of pedunculated exogenous daughter cysts and of free endogenous ones.

In a woman who finally died of cirrhosis of the liver, there were present coenurus cysts in 3 sites: the left thigh, the right subscapular region, and the right iliac region. They had been noticed for about 6 months. The first was removed under a local anaesthetic from between the fibres of the quadriceps, but in doing so its contents were lost. The others were examined after death. The subscapular tumour contained 15 cc. of fluid, measured 70 by 40 mm., possessed seven islets of scolices, 463 in all, 3 external ramified, pedunculated and extremely motile daughter cysts, and 19 vesicular internal ones, all daughter cysts being without scolices. The iliac cyst measured 30 by 20 mm., contained 2 cc. of fluid and appeared to consist only of 50 daughter cysts measuring 1 to 6 mm. across, of various shapes, and with numerous scolices in various stages of development. The normal scolex showed 4 suckers and two circles of 16 hooklets each, the large measuring 130 to 150 μ and the small 90 to 105 μ , the only anomaly being one head without its circle of large hooks. The four other human coenurus cases are noted with their references, the other of *C. serialis* being by BONNAL, JOYEUX & BOSCH (*ante*, p. 120)

C L.

KUTSCHINSKY (W.). Ueber Dehelminthisation bei Hymenolepidosis mit Osarsol. [Treatment of *H. nana* Infestation with Osarsol.]—*Med. Parasit & Parasitic Dis.* Moscow. 1933 Vol. 2. No. 3 pp. 151-154. [In Russian. German summary p. 154.]

The author describes the treatment of *Hymenolepis nana* infections with two tablets of osarsol (=stovarsol), twice daily for 3 days. In five cases described in some detail the treatment resulted in the temporary absence of ova from the faeces during about 4 months in 2 cases, and in their complete disappearance in 3 cases C. A. Hoare.

SCHWENNICKÉ (Helmuth) Helminthiasis oder Hernia epigastrica? [Helminth or Epigastric Hernia?]-*Muench Med Woch.* 1934. July 13 Vol 81. No. 28. pp 1048-1049.

The answer is—A tapeworm.

A girl of 14 had a median swelling as large as a cherry between xiphoid and navel, disappearing on pressure and returning when this was relaxed, pressure being painful. Laparotomy revealed no hernial sac, nor was any opening of such found from the peritoneal side. She passed some segments of tapeworm later and, after *Filix mas*, a head which is unarmed C. L.

Hsü (H. F.). Remarks on Some Morphological Characters of Parasitic Nematodes of Man and Dog together with Description of a New *Goezia* Species from Yangtze Beaked Sturgeon.—*Chinese Med. Jl.* 1934. Nov.-Dec. Vol. 47. Nos. 11 & 12. pp. 1289-1297. With 7 figs. on 1 plate. [26 refs.]

Two parasites of man are included, *Terndens deminutus* and *Enterobius vermicularis*.

T. deminutus possesses a gubernaculum, narrow and thick anteriorly, broad and thin posteriorly, leaf-shaped in ventral view with its base cephalad and measuring 0.107 mm long by 0.053 mm. broad.

E. vermicularis—After recording views by 4 helminthologists from 1926 onwards that the male possesses 5 pairs of caudal papillae, Hsü adds "I come to the conclusion that there are actually six pairs of caudal papillae in the male specimens of *E. vermicularis* and that the old description given by LEUCKART is perfectly correct. Modern investigators have usually overlooked the small pair of sessile papillae which are situated lateral to the most anterior pair of the pedunculated papillae." [His drawing closely confirms that of the reviewer: BYAM & ARCHIBALD's *The Practice of Medicine in the Tropics*, 1923, Vol. 3, p. 1877, fig. 644B.] C. L.

LI (H. C.). Feeding Experiments on Representatives of Ascaroidea and Oxyuroidea.—*Chinese Med Jl.* 1933. Nov.-Dec. Vol. 47. Nos. 11 & 12. pp. 1336-1342.

The worms investigated feed essentially on the intestinal contents of the host, though damage to the intestinal wall is possible.

Hosts of *Toxocara canis*, *Toxascaris leonina*, *Ascaridia lineata*, and *Heterakis gallinae* were fed on charcoal and those of *A. lineata* on starch, and there was examination of the contents of *A. lumbricoides* from man. In the last case its intestine was opened and part of the contents embedded in paraffin and sectioned; in 9 specimens these contents could not be identified, in the tenth two ascaris eggs and some striated muscle were found. C. L.

NIÑO (Flavio L.). Miositis verminosa. (Consideraciones diagnósticas y parasitológicas.) (Nota previa.) [Vermineous Myositis.]—*Bol. Inst. Clin. Quirúrg.* Buenos Aires. 1933. Vol. 9. Nos. 79, 80 & 81. pp. 346-348. With 5 figs.

A nematode in the dorsal muscles caused a chronic interstitial myositis.

A countryman of 63 had a tumour in the back on the level of the left shoulder, taken to be a sarcoma. Section of the specimen showed a nematode lying between the muscular bundles and having a transverse diameter of 0.2 to 0.5 mm. with a chitinous surface, a muscular coat, 2 uteri, and an alimentary canal. Parts were cretified. Round it was an interstitial myositis with giant cells
C. L.

TOPPICH (G.). Nematodenbefunde im Gehirn bei Pellagra. [Nematodes in the Brain in Case of Pellagra.]—*Deut. Med. Woch.* 1934. June 1. Vol. 60. No. 22. pp. 814-817. With 5 figs.

In a woman diagnosed as dying from pellagra, two nematodes were found in the brain.

She suffered from mental depression and confusion, was emaciated and pale, and in her brain were found two nematodes; one a male in the cerebrospinal fluid within the ventricle in the frontal region just visible to the naked eye, and another smaller (and judged to be young on the ground that no cuticle could be found) behind the chiasma. It is pointed out that this find does not constitute evidence that pellagra is the result of a nematode infection. [There is no mention of skin eruption.] C. L.

OTTO (G. F.) & CORT (W. W.). The Distribution and Epidemiology of Human Ascariasis in the United States.—*Amer. J. Hyg.* 1934. May. Vol. 19. No. 3. pp. 657-712. With 1 map. [51 refs.]

This paper summarizes published and unpublished information on the ascaris problem in the United States.

Much of it has, then, already been abstracted in this *Bulletin*. The noteworthy points of more than local importance seem to be as follows. Endemic centres are the Appalachian Mountains and their foothills, south central Louisiana, south eastern N. Carolina and Tampa in Florida. In the Appalachians, and in ascaris families elsewhere dwelling in areas otherwise worm-free, there is pollution of the immediate surroundings of the house; elsewhere faeces are deposited at some distance from the house. In the Louisiana area a clay soil is kept damp by a high water table, and in the Carolina areas most ascaris families live close to swampy land. In treated populations the original level of infection is regained within 8 months (so that treatment without sanitation is unavailing) while children in a sanitary orphanage have lost infection in 13 months. When the resources of the family hardly suffice for food and clothing, they will not be used for sanitary improvement, particularly in places where many families have not used or even seen a privy for generations and where the school has an open-backed dirty latrine or none at all. The schools must have first class sanitary arrangements suitable for children's use. "The whole process will probably take generations" [as SMILES has insisted for years]. C. L.

OTTO (G. F.) & CORT (W. W.). Further Studies on Post-Treatment Reinfection with Ascaris in the United States.—*Jl. Parasitology.* 1934. June. Vol. 20. No. 4. pp. 245-247.

Post-treatment reinfection was rapid, widespread and intensive. Treatment was by varying doses of hexylresorcinol in nearly 300

children Taking the ascaris-infected which were re-examined, the percentages positive 2 to 3 weeks, 5 months and 8 months after treatment were 52, 78 and 85; the average numbers of eggs per cc. of faeces before treatment, and at these same intervals after it, were for the positive cases 23,000, 10,600, 21,800 and 38,700, and for the whole number, positive or negative, 23,000, 5,500, 17,100 and 33,000. The authors point out the futility of attempting to control ascaris infection by treatment alone. [Indeed the number of eggs, that is the risk to the community, was increased by some 50 per cent. after and presumably as a result of treatment.] C. L.

GIRGES (Rameses) **Studies on Ascariasis. I.—Geographical Distribution: with Special Reference to Egypt. II.—Endemiology.**—*Jl. Trop. Med. & Hyg.* 1934. Mar 15. & Apr. 16. Vol. 37. Nos. 6 & 8. pp. 85-90, 114-119.

The first part of this paper points out that in Upper Egypt the incidence of ascariasis ranges from 0.7 to 3 per cent. rarely reaching 8 to 10 per cent., whereas in Lower Egypt it affects about half the population. The cause of this great difference is held to be the fact that vegetables in Upper Egypt are never manured, as they are in lower Egypt, with night soil, so that the link between food and ova is cut off. Moreover Upper Egyptians derive their water from the river or wells, Lower Egyptians from contaminated canal water. A list of percentages of infection collected from world-wide literature follows. Indebtedness to this *Bulletin* is acknowledged.

The second part considers the literature, as displaying the non-identity of human and porcine ascaris, the conditions favouring growth—namely climate, season, temperature, humidity, light, soil, oxygen, altitude, and pH, modes of transmission by wind, insects, unconscious coprophagia including vegetables, fruit and drinking water, and direct infection, which term is here restricted to swallowing ova from dirty hands; the factors promoting dissemination of ova including promiscuous defaecation and manuring with nightsoil; modes of infection by mouth, skin, nasal mucosa, through the placenta and breast; factors promoting infection, namely fecundity of the worm, infectivity of the egg, resistance of ova and larvae and their longevity. C. L.

GIRGES (Rameses) **Studies on Ascaris. III.—Aetiology and Prophylaxis.**—*Jl. Trop. Med. & Hyg.* 1934. June 1. Vol. 37. No. 11. pp. 162-166.

Aetiology.—"For an individual to be infected, embryonated eggs should arrive in his alimentary tract in water or food," and in this connexion some stress is laid on geophagy. The infection is considered under age, sex where women are held to be more liable than men to be geophagists, residence especially town dwelling, occupation with almost equal affection of all classes though infection is very rife among those working on the soil, crowding, eating uncooked vegetables, avitaminosis, and dirty habits.

Prophylaxis.—For the intracorporeal stage there is mass treatment, and, for the extracorporeal, substitution of the use of latrines for promiscuous defaecation, the change to be effected by propaganda through pamphlet, schools, and religious teaching, by the removal of praying places from the banks of canals since defaecation must be followed and prayer preceded, by washing and there is a general

tendency to make one washing cover both objects, by reformation of villages and their latrines, and by the avoidance of unboiled or unfiltered water and of raw vegetables' The difficulties in attainment are pointed out As to treatment the advantages of worming the whole population once or twice a year are stated The fact that there is no cheap and safe sanitary privy is stressed The showing by STILES that a privy may have a radius of influence for evil is put side by side with the opinion of OTTO that any privy regularly used will effectively control ascaris infection. The very name for nightsoil used by the fellaheen (rismal, that is stock or capital) shows the difficulty inherent in its sanitary disposal, in which connexion the possibilities and limitations of the septic tank are considered, and the last sentence reads "One should endeavour to combat geophagy and all perversions of taste in children and degenerates." C. L.

GIRGES (Rameses). *Pathogenic Factors in Ascariasis.*—*Jl. Trop. Med. & Hyg.* 1934. July 16 Vol. 37 No. 14 pp. 209-214.

A survey of the literature under the heads of toxins, and of irritative and inflammatory, traumatic, bacteriferous, mechanical and migratory actions. C. L.

LIÈVRE (H.) A propos de l'hématophagie des *Ascaris* [*Haematophagia of Ascaris.*].—*C. R. Soc. Biol.* 1934. Vol. 116. No. 26. p. 1079

It is held that ascarids do not normally feed on blood.

Finding of iron in the intestinal cells, as reported by ASKANAZY, may merely mean that it has been obtained from animal food. BRUMPT has found no evidence of ecchymosis or congestion of the intestinal mucosa in numerous autopsies of those infected Lièvre has ground up in water the intestines of ascars of man and pig, *A. megalocéphala* of the horse and *Toxocara canis* of the dog, reduced haemoglobin in the supernatant fluid by potash, and examined by spectroscope for haemochromogen. This was present in 75 per cent. of intestines but the quantity was so small as to be logically attributable to the fleshy food of the animal. [The paper does not disclose the particular animal on which the horse is believed to have fed.] C. L.

STEWART (F. H.). *A Method of incubating Ascaris Eggs.*—*Indian Jl. Med. Res.* 1934. July. Vol. 22. No. 1. p. 1.

A method is described for securing the three requisites for development of ascaris eggs—a moist atmosphere, a temperature of 25°C. and clean surroundings. From 2-inch lengths of the ascarid uterus the eggs are pressed out under water, the eggs from 2 or 3 such sections are transferred to a test tube containing 1½ inches of water and evenly suspended by vigorous shaking of the corked tube. The tube is held horizontally and slowly and evenly rotated on its axis. The inside of the tube becomes coated with a uniform layer of eggs.

"It is the outer albuminous coat which causes the egg to adhere. When the greater number have thus adhered the tube is turned upright; the water collects at the lower end leaving the eggs in air which is kept moist by the corking of the tube. The tubes are kept at room temperature in the summer or in a low temperature incubator at about 25°C. If the contents become at all foul the water should be changed with a pipette Under these conditions the eggs segment and develop steadily until each

contains an active embryo. Samples can be taken out at intervals on the point of a scalpel and examined in water, and finally the whole cylinder of ripe eggs can be scraped out on the edge of a knife." C. L.

MOMMA (Kenji). **Agglutinative Action of Normal Blood Serum on Granules in Vas deferens of Ascarids.**—*Arch f Schiffs- u Trop-Hyg.* 1934. July. Vol. 38. No. 7. pp. 273-282. With 5 figs. [17 refs.]

A new serological test fails to find any difference between ascaris of man and pig.

In 1929 Momma accidentally discovered that the granules in the lower part of the vas deferens of ascarids [presumably the spermatozoa] were agglutinated by sera from man, dog, rabbit and cat; and that when this had reached a saturation point the supernatant fluid, obtained by centrifuging, no longer agglutinated these granules. Then becoming aware of YOSHIDA's work (1928) showing that human spermatozoa coming into contact with human serum absorbed specifically a similar agglutinin, he set to work to discover whether sera in contact with pig and human ascaris granules become similarly saturated. He found that they did and adds, "these experimental results are able to offer a new ground for the identity of both species." C. L.

ESSED (W. F. R.) & VAN THIEL (P. H.). Een merkwaardige vorm van ascaris-eieren. [A Curious Form of Ascaris Egg.]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1934. Apr. 24. Vol. 74. No. 9. pp. 551-552. With 4 figs. on 1 plate.

The appearance as of an operculum in some unfertile ascaris eggs is noted.

A patient in Soerabaja was treated twice with *Felix mas* (the duodenal sound being used on one occasion) in the belief that he harboured *Diphyllobothrium latum*. The eggs were, however, atypical unfertile ascaris eggs, the shell at the pole (or poles) being so thinned as to give the appearance of an operculum. It is pointed out that in one of the microphotographs illustrating a paper by FÜLLEBORN (this *Bulletin*, Vol. 29, p. 751) an indication of an effect of this kind is visible. C. L.

WANG (K. C.). **The Treatment of Ascariasis with Hexylresorcinol.**—*Chinese Med. Jl.* 1933. Nov.-Dec. Vol. 47. Nos. 11 & 12. pp. 1433-1437.

After strict starvation 1 gm. of hexylresorcinol was followed by 30 cc. of a 50 per cent. solution of magnesium sulphate and stools were examined 11, 12 and 13 days after treatment. All three examinations were negative to an unstated technique in 78.4 per cent. of cases.

"It has been our experience that cases resistant to a first treatment of hexylresorcinol are resistant to all forms of treatment, as most of the 16 cases with positive stools after treatment from this series required more than two courses of different drugs to get a cure. In a few instances hexylresorcinol was repeated as the second course. Of these [the] majority remained . . . positive, and a third course was given, chenopodium or santonin being substituted.

"In only two of the 74 cases treated with hexylresorcinol have symptoms been complained of. In the first case anorexia lasting several days occurred, but this cleared up without treatment. In the second case abdominal pain and diarrhoea were produced and lasted one day." C. L.

LIOTIER (Raymond). Sub-occlusion intestinale par peloton d'ascaris — [Intestinal Subocclusion by a Mass of Ascaris.]—*Marseille-Méd.* 1934. Mar. 15. Vol 71 No 8 pp. 364-366. With 1 fig.

In a child of four, a mass of 30 ascarids formed a knot in the ileum close to the ileocaecal valve visible through the intestinal wall at an operation undertaken for colic and pain about McBurney's point. The mass was removed by transverse enterotomy. C. L.

ALBERT (Jose) & PAULINO (Peregrino H.). Report on Some Instructive Cases of Heavy Ascariasis.—*Jl. Philippine Islands Med. Assoc.* 1934. July. Vol. 14. No. 7. pp. 269-270.

Three fatal cases are described.

Two of these have already been reported to the Manila Medical Society. They died of intestinal obstruction from ascarids. The third, a boy of 8, died of meningitis with jaundice, probably haemolytic, with 235 adult ascarids in the bowel. C. L.

- i. HODGMAN (J. H.). Ankylostomiasis on the Gold Mines of the Witwatersrand.—*Irish Jl. Med. Sci.* 1934. May. 6th Ser. No. 101. pp. 203-222.
- ii. ORENSTEIN (A. J.). Hookworm in Gold-Mines. [Correspondence.]—*Lancet.* 1934. July 7. p. 51.

i. "Our recent investigations prove that our mines are to-day clear of hookworm ova and larvae and that it is impossible for any miner to be infested or re-infested.

"Our underground soil prophylaxis has thus reached perfection."

In 1886 gold mining by the dry method was started on the Witwatersrand. The miners came up covered like millers with a fine greyish dust, they developed silicosis within 5 years and on the average were dead within 10. Seventeen years ago a hollow steel drill through which water was passed was substituted for a solid one and the miners came up covered with mud; two years later ankylostomiasis was first recognized and after seven years became alarming. The average vertical depth of mines in the 60-mile-long Reef is 7,000 feet or 500 feet below sea level and the average temperature at the bottom is 75°F. Conditions are, then, propitious for the development of infective hookworm larvae. When it was found that 52 of 67 students of the Government Miners' Training School were infected, investigation of 1,000 Europeans living on the Rand and who had not left it for 5 years showed no hookworm ova. The percentages in recruited natives were 41.5 and for those who had worked in the mines for 10 to 22 months 51.1. Below ground the sanitary conditions were appalling, the latrines grossly fouled, disused slopes, shafts and drives filthy, the soil heavily infected with mature hookworm larvae, and millions of cockroaches and thousands of rats were broadcasting human faeces on their bodies, so aiding the native "sanitary" boys' careless slopping of faeces about as they carried it from latrines to skips, as the lifts are called. A lucky accident led to the re-discovery of what LAMBINER had demonstrated in 1906, the lethal effects of common salt. At first a coal tar disinfectant had been used but its lack of penetrative power showed itself by the discovery of flourishing larvae a quarter of an inch below the surface. Now the procedure is to scrub everything weekly up to 2 feet from floor level with a 20 per cent. solution of salt and to strew a layer of salt $\frac{1}{4}$ to $\frac{1}{2}$ inch deep on the floors of and round the latrines, and in the buckets themselves.

Nearly always the worm is *A. duodenale*. A native boy expelling 1,000 worms with one treatment may show little handicap, a European miner would be greatly debilitated. No Europeans have died. Four deaths from ankylostomiasis have occurred and the post-mortem condition is noted in two. They showed 3,553 and 4,342 hookworms respectively, some in each case in the large intestine. [*Ternidens deminutus* was in 1908 found by TURNER (and identified by LEIPER) in these mines, and BLACKIE (this *Bulletin*, Vol. 29, p. 401) reported them in the caecum and ascending colon of man in Southern Rhodesia.] Treatment was evaluated by the tedious and repulsive method of worm collection. Thymol [unparticulated and given with the old restriction of rest and starvation which if applicable to one is applicable to all anthelmintics] cured 75.5 per cent. in one treatment. Carbon tetrachloride was given in 61,000 doses of 3 cc. with 5 deaths and 27 non-fatal poisonings and has been abandoned. For 2 years "thousands of cases" have been treated with carbon tetrachloride 2 cc and 1 cc of oil of chenopodium of unstated ascaridole content "with no apparent bad or fatal results. Records show that most of our patients were cured with one treatment, others with two, a third was occasionally necessary." Diagnosis was by Willis's method.

ii. Referring to a leading article in the *Lancet* on HODGMAN's paper, Orenstein writes denying a number of his statements. After 20 years' work he has never seen cockroaches in gold mines in notable numbers, experiments have failed to confirm the suggestion that "viable" ova can pass through rats, of East Coast native recruits about 40 per cent. are infected, but they constitute less than a third of the labour, among the remaining two-thirds it is rare; the infection rate decreases with residence on the mines and without mass treatment; it is the grossest possible exaggeration to describe the latrine conditions as appalling.

C. L.

SCOTT (J. Allen), AYOUB (George E.) & REITLER (Rudolph) **Hookworm Disease in the Coastal Plain of Palestine.**—*Amer. Jl. Hyg.* 1934. May. Vol. 19. No. 3 pp 601-628 With 5 figs.

An apparent increase in infection with *Ancylostoma duodenale* about Jaffa during recent years seems to be correlated with the amount of orange culture, which itself is dependent on local variations in soil, and on summer irrigation.

Citrus is grown where there is a brick-red loamy sand, well drained and suitable for irrigation. Both Willis's and the Stoll-Hausheer methods of diagnosis were used. "The two series agree fairly well in view of the sampling error involved and the expectancy that the former would average slightly higher than the latter." [Analysis of the authors' figures of stools obtained from the same localities shows that 437 persons examined by Willis's method showed an infection rate of 60 per cent. while 1,951 examined by the Stoll-Hausheer method showed one of 49.] Of the various faecal egg-count groups into which the figures are divided, the largest is that with counts between 800 and 1,300 per gram. Counts are corrected for consistency, and logarithms are used to get curves or polygons. Viable embryonated ascaris eggs were found in the soil of yards of houses wherein lived infected children and their infection in some villages was sufficiently heavy seriously to affect their health. By Baermann's apparatus infective hookworm larvae were isolated in the winter season from corners

between houses, vacant spaces, less frequented streets, disused mills, the banks of streams, the outskirts of villages and the orange groves. In each of these groves is set a house, and pollution of soil is most concentrated in a semicircle just sufficiently large to be concealed by foliage from observation through the gate in the wall, which surrounds the buildings, and this lies opposite the house itself, pollution is also scattered throughout the grove. During the summer-time irrigation of these groves, soil samples produced hookworm larvae usually to the number of 100 or more, but frequently to several thousands, whereas in winter the numbers were a few dozen at most. As to haemoglobin the conclusion suggested is that an infection producing more than 2,000 eggs per gram. usually lowers this, and one of over 5,000 markedly so. Bored hole latrines are being instituted to dispose of faeces. C. L.

LEGER (Marcel). Notions de prophylaxie collective et individuelle à propos de l'ankylostomiasse à la Guadeloupe [*Hookworm in Guadeloupe. Collective and Individual Prophylaxis.*].—*Rev. Prat Malad des Pays Chauds* 1934. Jan 13th Year. Vol 14. No 1. pp 601-606, 609-610, 613-614, 617-618 [10 refs.]

The paper's title shows its aim and scope

The preponderating species of hookworm in Guadeloupe is *N. americanus* (Stiles 1902), it being pointed out, however, that MARÉCHAL in 1868 (*Bull. Soc. Path. Exot.*, 1921, p. 159) recognized that the hookworm of French Guiana was distinct from that of Europe. Leger found 108 of 158 persons infected and compares these figures with those for Martinique and French Guiana, but since the diagnostic technique is in no case mentioned their real or comparative values remain uncertain. He sharply distinguishes sick and carriers, though he seems to feel that in secondary bacterial invasion lies the essential feature which divides one from the other, insists that both classes are hygienically dangerous, and refuses to estimate their relative numbers. In tropical countries any hope that in present conditions general hygiene will affect eradication of the hookworm is held illusory, but the various procedures which are advised for stool disposal are enumerated. Personal hygiene by the use of footwear, by individual diagnosis and treatment, and by education is dealt with. The paper ends by quoting MANSON's saying that in warm countries many live close to the borderline between health and illness, and that this infection may be the last drop which makes the vessel spill over. C. L.

KELLER (A. E.), LEATHERS (W. S.) & RICKS (H. C.). *An Investigation of the Incidence and Intensity of Infestation of Hookworm in Mississippi.*—*Amer. Jl. Hyg.* 1934. May. Vol. 19. No. 3. pp. 629-656. With 4 maps & 3 graphs. [15 refs.]

The authors have investigated the present incidence of hookworm infection in Mississippi. Compared with the figures obtained in 1910-14 by the Rockefeller Sanitary Commission there has been considerable betterment.

The diagnostic method employed was the Stoll-Hausheer, using 1/200 gm. of faeces in all. Since the early figures were obtained by smears the first step was a comparison of 2,412 faecal specimens examined by both techniques. A single slide by each method gave 42.2 per cent. positive by the first and 35.1 by the smear, while a second

slide made the figures 44 and 39.4. Accordingly if the smear methods of the two periods are comparable any lowering of incidence will not be due to methods of examination. In discussing soil and climate, it is held that if 50°F. is, in the mean, the minimum temperature at which larvae will develop to infectivity, it is possible for them to "remain infective" for 8 months in Southern and 7 months in Northern Mississippi. Of the white population 44,380 were examined and showed an infection rate of 19.6 per cent while from the same counties the earlier investigation showed one of 53.1 in 80,688. Some of the figures for the two periods are interesting. In Alcorn county they were respectively 65.7 and 1.7 but in Attala 16.8 and 15.4. With the exception of persons of 4 years old and under and of those of 55 and over, more males were infected than females; the maxima were 33.4 per cent. for males between 15 and 19 and 21.1 per cent. for females of that age, the averages 22.9 per cent. for males and 16.9 per cent. for females, and egg numbers per gram of faeces were 2,100 and 1,800 respectively. For each county the incidence of infection ran parallel with egg numbers; the same held for infections within the family—as the numbers of infected persons increased so did the egg numbers; and it is estimated "that there are approximately 86,000 infested persons in the rural white population of the 52 counties studied"; [only if it be admitted that to examine 1/200 gm. of faeces will disclose infection when there are 30 or 40 eggs per gram. At least the findings add yet further to the force of the conclusion that egg counts as a means of grading hookworm infected populations are an expensive and tedious way of obtaining information which is equally well given by a positive or negative finding by a not-too-accurate technique.]

Of 6,441 negroes only 1.4 were found infected and here again the average egg numbers were lower, so that about 12 times as many whites as negroes are infected.

About 10 per cent. of the rural homes in the 35 counties are provided with satisfactory means of excreta disposal. The influence of a sandy soil in furthering infection is once again displayed. C. L.

RAYBAUD (A.). L'ankylostomose, maladie paysanne. [*Ankylostomiasis, a Rural Disease.*]—*Marseille-Méd.* 1933. Dec. 15. Vol. 70. No. 35. pp. 677-686.

Essentially Raybaud wishes to impress on French readers that an infection common in Italy ought to receive greater attention than it does in adjacent France.

After a historical survey in which Italian work is emphasized, the question of infection of agricultural workers in the south of France is considered. As to conditions said to be favourable or unfavourable to infection, they do not all fall in with the unquestionable experience of others, for he holds that ancylostome larvae seek the subsoil, those of necator the surface, that a clay subsoil is the most favourable medium for development, that a female necator posits 2,600, and ancylostome 9,000 eggs daily. As to diagnosis, anaemia is taken as the master symptom and considerable stress is laid on the belief that to find hookworm eggs in anaemic cases in no way justifies a diagnosis of ankylostomiasis, they must be numerous—over 200 in a preparation made by an unstated concentrative method using an unstated quantity of faeces. In treatment, thymol is given the first place in dosage of 3 gm. (45 grains) daily for 3 days, the need for particulation being

unmentioned. Next is placed tetrachlorethylene on 3 consecutive days in increasing doses of 3, 4 and 5 gm. Carbon tetrachloride is interdicted for its risks. While treatment of the individual should be limited to those obviously ill, for prophylaxis it should include all infected and in prevention the blank wall of ignorance and apathy must be faced.

C. L.

CRUZ (Walter Oswaldo). [In Portuguese & English.] Da medulla ossea na ancylostomose. **On Bone-Marrow in Hookworm Disease.**—*Mem. Inst. Oswaldo Cruz.* 1933. Vol. 27. No. 4. In Portuguese pp. 423-453. With 35 figs. (3 coloured) on 17 plates. In English pp. 454-470.

In 24 deaths from pure hookworm disease there was active regenerative change in the diaphyseal marrow of the femur, but since this did not produce a normal blood, the marrow must in spite of appearances function subnormally.

This is evidently a continuation of work already reported (this *Bulletin*, Vol. 30, p. 218 and note). The appearance on microscopic examination of cancellous marrow is stated in all cases and the figures are profuse and well reproduced. Macroscopically the uniform redness of the marrow is in marked contrast with the pallor of all other organs. Microscopically there is in the marrow great decrease of fat cells with intense proliferation of the essential cells—increase of eosinophil myelocytes and no certain alteration in numbers of megakaryocytes; in the erythrocyte series there are always many foci where there preponderate orthochromatic erythroblasts with nuclei in pyknosis or rhexis. FERRATA is quoted as to the method by which the erythroblast becomes an erythrocyte, namely by pycnotic reduction of the nucleus which is then expelled piecemeal or in toto, or is dissolved in the cell. WITTS (*Lancet*, 1932, Vol. 1, p. 549) pointed out that iron is essential for the normal ripening of an erythroblast into an erythrocyte and Cruz found, in two cases which were given iron before they died, that there was "a manifest predominance of erythroblasts with nuclei already segmented, and that in one a reticulocytosis appeared before he died on the second day." Cruz accordingly concludes that the anaemia is not brought about by blood destruction produced in any manner whatever, nor is it caused by exhaustion of the marrow by over-use (excitation by intestinal haemorrhage) or by some toxin, but it is produced by some action of the parasite upon iron metabolism which lessens the amount of this element in the organism and so interferes with blood formation.

C. L.

CRUZ (W. O.). Metaplasia mieloide do baco na ancilostomose. [**Myeloid Metaplasia of Spleen in Hookworm Disease.**]—*Mem. Inst. Oswaldo Cruz.* 1934. Vol. 28. No. 2. In Portuguese pp. 287-298. With 7 figs. on 3 plates. [13 refs.] [Discussion, summary and conclusions in English pp. 299-303.]

The author's summary is as follows :—

"We investigated, in the liver and the spleen of ten pure cases of ankylostomiasis, haemocytopoietic elements. We verified the weight of spleen in 23 cases of individuals from 3 to 60 years old. In no case did we meet with haemopoietic cells in liver. In seven cases we found in spleen elements of the red series at an advanced evolutionary stage (orthochromatic erythroblasts with pyknotic nucleus). In some of these cases we

observed megakaryocytes and numerous eosinophilous myelocytes. The three cases which did not show any myeloid metaplasia in spleen were from individuals of over 50 years. Nevertheless, in another case of an individual 59 years old this metaplasia was verified. In individuals of over 20 years, the average weight of spleen in nine cases appeared to be equal to the normal weight. In 14 other cases, between 3 and 14 years of age, the weight of this organ was always sensibly higher than in normal individuals of the corresponding age.

"These results suggest the possibility of the myeloid metaplasia being the fact responsible for the weight increase of spleen in young individuals victimized by hookworm anaemia.

"The remarkable proliferation of orthochromatic erythroblasts shows that the degree and quickness of blood regeneration after iron administration are due, essentially, to the great quantity of haemoglobin previously formed in the spleen and bone marrow of ankylostomized organisms."

C. L.

CRUZ (Walter Oswaldo). *Therapeutica da ankylostomose* [Treatment of Ankylostomiasis].—Reprinted from *O Hospital* Rio de Janeiro 1933 June. pp 471-476. With 4 figs.

The drug essential in the treatment of ankylostomiasis is iron.

It is held that all modern works on tropical medicine, and the writings of most specialists, concern themselves only with anthelmintics in the treatment of this infection, though in fact its ill effects are the result of a disordered metabolism of iron. When, and in whatever form, iron enters the stomach it is ionized by the gastric juice and transformed into a ferrous salt which is immediately absorbed on reaching that part of the duodenum where the reaction is still acid. After absorption it reaches the normoblasts in bone marrow and stimulates their activity. An advised dose is 3 gm. of reduced iron which in 20 cases has produced uniform regenerative changes in the red cell series of the bone marrow. This is red in colour, and the normoblast in it is, in ankylostomiasis, held to contain as much iron as does a normal one, but more iron, apparently twice as much, is needed to convert it into a red corpuscle, and that iron in grave cases has to be supplied.

Deaths from this infection have occurred in Cruz's experience from one of 3 causes: toxicity of anthelmintics, heart failure caused by blood transfusion into the patient, failure to give iron. Nevertheless on giving iron there is a latent period of 2 or 3 days before its effects begin to appear in the peripheral blood, and during that period the serious case is in grave danger. No vermifuge, it is held, should be given till the haemoglobin reaches 50 or 60 per cent. A table shows 12 cases in which after 15 days of treatment by reduced iron the mean haemoglobin had risen from 32 to 48 per cent. by Sahli's instrument, and the red corpuscles from 1,820,000 to 3,310,000, and two photographs show how considerably the oedema had been reduced in one case during that period.

C. L.

BIGGAM (A. G.) & GHALIOUNGUI (Paul). *Ancylostoma Anaemia and its Treatment by Iron*.—*Lancet*. 1934. Aug. 11. pp. 299-304. With 7 figs. [11 refs.]

Iron can correct ancylostoma anaemia even when the patient is still harbouring the worms, but removal of the worms alone produces little or no change in the blood picture.

This anaemia, it is confirmed, is microcytic (the average size of the red corpuscles by Eve's halometer was 7.44μ against a normal figure of 7.6μ) and hypochromic. In apparently 94 cases the average erythrocytes were 2,900,000, haemoglobin 27.8, colour index 0.47, and the lowest figures were 1,400,000, 10, and 0.15. It is pointed out that the plethora of plasma, shown by BOYCOTT and HALDANE, accounts for the everyday experience of cases with only 20 per cent. of haemoglobin, yet complaining merely of slight dyspepsia or pains in the knees on walking. Van den Bergh reaction was always negative so that there was no question of haemolysis, and occult blood was nearly always found in the stools, while before treatment reticulocytes were always less than 1 per cent. In all but 8 cases the worms before iron treatment were got rid of by carbon tetrachloride repeated weekly, there were no ova by "the floatation method" and further doses revealed none. Hexylresorcinol was unsatisfactory. The greatest number of worms expelled was 141 and generally speaking with an anaemia of 40 to 60 per cent. (80 per cent. by Sahli's instrument being taken as normal) the number of worms did not exceed 20. Moreover, in some cases with no ova found in the stool by this inexactly specified diagnostic technique the clinical symptoms led to the giving of an anthelmintic, "and not infrequently large numbers of worms were expelled."

As to treatment, *Ferrum redactum* 2 gm. thrice daily (70 cases) gave the best results, 5,500,000 red corpuscles and 75 per cent. haemoglobin in 7 weeks, but in 5 cases with hypochlorhydria these figures were 5,400,000 and 54.5. Usually there was a reticulocytosis of not more than 10 per cent. *Blaud's pill* 150 grains [10 gm.] daily was given to 10 patients mostly achlorhydric pellagrins with results similar to such cases under reduced iron. *Ferrous chloride* 0.3 gm. daily (4 cases) gave very poor results. *Liver* 250 gm. daily, fresh and lightly cooked (9 cases) gave a poor response for haemoglobin, though the red corpuscles rose to 5,000,000. In 4 cases iron was withheld, with practically no improvement in 4 weeks. In 8 cases reduced iron was given as above without evacuating the worms. There was rapid improvement, the haemoglobin rising from about 30 to 66.7 in 5 weeks so that "large doses of iron can correct ancylostoma anaemia even when the patient is still harbouring the worms, but the probability is that such cases, if the iron was discontinued, would relapse to their former condition." Iron by intravenous injection had little effect; by intramuscular injection there was sometimes marked reaction, but it is exceedingly painful unless combined with 1 cc. of 2 per cent. novocaine solution.

C. L.

YAMADA (Akira) & INOUE (Kazuo). *Nourishment of Anchylostoma caninum and the Histological Changes of Intestine thereby produced.*—*Jl. Oriental Med.* 1934. Apr. Vol. 20. No. 4. [In Japanese. English summary pp. 52-53.]

It is believed that *A. caninum* possesses a very strong histolytic secretion capable of digesting the host's tissues, that red corpuscles are not digested since they show no morphological change and no iron pigment was found in the worms, that white corpuscles are not digested, that plasma and lymph must be considered as food, that the intestinal lesions are mechanically and chemically caused, and that the female worm produces greater local damage than the male. [The reviewer

has obtained the iron reaction in the bodies of hookworms, and over 20 years ago LOOSS described dehaemoglobinization of red corpuscles in the intestine of *A. duodenale*.] C. L.

DE ALMEIDA (Jayme Lins). De l'existence du *Necator americanus* (Stiles, 1902) (Nématode) chez le *Coendu villosus* Cuv (Roentenia) au Brésil [*N. americanus* found in the Rodent *C. villosus*.]—*C. R. Soc. Biol.* 1934. Vol. 116. No. 26. pp 1154-1155. With 1 fig.

About 15 worms, identified as *N. americanus*, were found in the small intestine of the tree porcupine *Coendu villosus*.

The males were 4.8 to 6 mm long and the females 5.5 to 7.5; other measurements are given and a drawing of the opened bursa of the male. The females though adult contained no eggs. C. L.

VAN DEN BERGHE (Louis). L'existence de *Ternidens deminutus* au Katanga. [*T. deminutus* in Katanga.]—*Ann. Soc. Belge de Méd. Trop.* 1934. June 30. Vol. 14. No. 2. pp. 189-191.

Judging by egg measurements *T. deminutus* was present in 10 of 204 faecal examinations in Katanga.

This district adjoins Rhodesia. The eggs in question measured 75 to 80 μ by 50 to 52 μ and corresponded in shape to those of *T. deminutus*. Carbon tetrachloride was given to 3 persons without recovery of worms though one of them, deemed to have a mixed infection, passed 4 female necators but still continued to pass eggs of ternidens type. Cultures failed to produce infective larvae. C. L.

FAUST (Ernest Carroll), WELLS (Joseph W.), ADAMS (Corine) & BEACH (Ted D.). The Fecundity of Parasitic Female Strongyloides.—*Proc. Soc. Experim. Biol. & Med.* 1934. June. Vol. 31. No. 9. pp. 1041-1043.

The number of strongyloides larvae recovered from the faeces is no necessary index of the degree of infection of the intestinal wall.

This is evidently in the nature of a preliminary note which explains the absence of published ground for the underlying but unexpressed assumption that all the female worms were enumerated in the examination of the intestinal mucosa, to which examination the investigation seems to have been limited. In dogs the female worms invade the mucosa at or soon after oviposition begins, and the larvae on hatching work their way into the lumen and are passed; but in the monkey it is the embryonated egg which is usually found in the faeces. Then two apparently conflicting observations are recorded. First, the average counts of progeny in the faeces are usually far in excess of the number of uterine eggs found in the females recovered; second, the number of parasitic females recovered was frequently in excess of expectation, being on two occasions more than the number of larvae "in the inocula." It is held that this excess can be explained only by internal infection, Faust's "hyperinfection." Yet it is noted that faecal larvae may be disintegrating so that, even with great care taken to discover them, such larvae may number 5 to 90 per cent. of the total yield. [But may they not be completely digested and undiscoverable, as the much larger adult hookworms almost certainly are?] Moreover, many living females were non-fecund, the faeces having shown no

larvae for weeks or months, other were encapsuled, and yet others in process of phagocytosis. Samplings of less than 5 gm. of faeces were frequently insufficient to display larvae, so that no one should be pronounced as free from infection without prolonged intensive faecal examination. "Even then the patient may be harbouring tens or hundreds of post-productive females which may account for characteristic symptoms of chronic strongyloides." C. L.

Niño (Flavio L.). Consideraciones diagnósticas y parasitológicas acerca de un caso de eosinofilia apendicular. [Diagnostic and Parasitological Notes on a Case of Appendix Eosinophilia.]—*Bol. Inst. Clin. Quirúrg.* Buenos Aires. 1933. Vol. 9. Nos. 79, 80 & 81. pp. 339-345. With 10 figs. [14 refs.]

Routine examination of an excised appendix showed in it a degree of eosinophilia never before met with at the Institute. The blood showed one of 13 per cent. Faecal examination disclosed strongyloides larvae, the duodenal sound none. Regarding the faeces, it is stated that some of the worms showed sexual differentiation even to the possession of spicules, no question being raised as to whether the stool was an old one. It is suggested that the patient may have had the infection for 26 years. C. L.

PROMMAS (Chalerm) & DAENGSVANG (Svasti). Nine Cases of Human Gnathostomiasis.—*Indian Med. Gaz.* 1934. Apr. Vol. 69. No. 4. pp. 207-210. With 3 figs. [10 refs.]

Particulars are given of 9 cases in which gnathostomes have been removed and identified by the authors.

Added to 12 cases reported by others to which references in the literature are here listed, this brings the total of human cases to 21, and an editorial footnote points out that a twenty-second was reported by MAPLESTONE in the Annual Report of the Calcutta School of Tropical Medicine for 1931. MAPLESTONE [this *Bulletin*, Vol. 28, p. 207] drew attention to the fact that of the 12 earlier cases the sex of the worm was noted in 4 and that in all it was male, in which connexion it is worthy of comment that in all the 9 cases now reported the worms are males. The swellings and symptoms produced, and their siting, are noted.

C. L.

RILEY (William A.) & SCHEIFLEY (Charles H.). Trichinosis of Man a Common Infection.—*Jl. Amer. Med. Assoc.* 1934. Apr. 14. Vol. 102. No. 15. pp. 1217-1218.

Examinations of the diaphragms of 117 cadavers in the dissecting rooms at Minneapolis showed 17.9 per cent. infected with trichinella.

The mode of examination was to slice the specimens thin and mount them on the trichina compressors of the type used by the Bureau of Animal Industry before microscopic examination of pork was discontinued in 1907. The average slide contained 5 square centimetres of compressed muscle and the heaviest infection showed 350 calcified measles in this quantity. It is believed that had 50 gm. of muscle been digested, as QUEEN did, the percentage of incidence would have been higher. It is suggested that there should be extension to small plants of the federal regulations regarding pork products which are ordinarily eaten raw.

C. L.

- PUND (Edgar R.) & MOSTELLER (Ralph) **Trichinosis: Demonstration of the Parasites in the Brain.**—*Jl Amer Med. Assoc.* 1934. Apr. 14. Vol 102 No 15 pp. 1220-1222. With 1 fig. [21 refs.]

Three weeks after vaccination a negro boy of 11 with sickle-celled anaemia was admitted to hospital for meningitis and died 23 days later. Routine microscopic examination of the brain disclosed trichinae, the naked eye examination showing merely congestion. The only voluntary muscle which had been sent on from the morgue was a small tab adherent to the section of the prostate about the size of the microscopic field of a 2/3 objective and it contained six encysted trichinae. There had been no diarrhoea and no eosinophilia. C. L.

- FRIEDLANDER (Richard D.) **The Present Status of the Diagnostic Intradermal Test for Human Trichiniasis.**—*Amer. Jl Med. Sci.* 1934 July. Vol. 188 No. 1 pp 121-123

The intradermal test is a valuable aid in the diagnosis of trichinosis. Friedlander writes to minimize any confusion which has been introduced by KILDUFFE (*ante*, p. 395) in his declared preference for eosinophilia over an intradermal test in the detection of trichinosis; for he used a dilution of 1 in 100 and read his results after 24 hours, whereas MCCOY, MILLER and Friedlander (this *Bulletin*, Vol 30, p. 694) have shown that in man the best results were obtained when dilution was 1 in 10,000 or more and when the immediate reaction was noted. It is agreed that the antigen is difficult to prepare and so to obtain, a very different matter from showing that it has not definite advantages, and it is pointed out that the presence of eosinophilia does not justify a diagnosis of trichinosis. C. L.

- TRAWIŃSKI (A.) & MATERNOWSKA (I.) **Ueber Präzipitationsreaktion bei Trichinose [Precipitin Reaction in Trichinosis].**—*Zent. f. Bakt. I Abt Orig.* 1934. Feb. 28. Vol. 131 No 1/2 pp 10-18.

A positive precipitin reaction was obtained from the thirteenth to the fifteenth day after trichinal infection of rabbits. The antigen was obtained by digesting freshly trichinosed material in gastric juice. The reaction took place at 37°C. in 30 minutes to 6 hours and was specific.

C L

- MCCOY (O. R.). **The Effect of Vitamin A Deficiency on the Resistance of Rats to Infection with *Trichinella spiralis*.**—*Amer. Jl. Hyg.* 1934. July. Vol. 20. No 1. pp. 169-180. [10 refs.]

In young rats a diet deficient in vitamin A diminished their resistance to trichinosis; in older rats this did not occur within the limits imposed by the experiments.

The vitamin A content of the liver was determined, and muscle infection was displayed by digesting the carcass in artificial gastric juice which isolates infective larvae unharmed, but dissolves young ones, so that when carried out within 30 days of an infection it does not measure the degree of infection. In each of 7 series of experiments the rats were divided into 2 equal groups, one being controls fed on a vitamin A containing diet, and the other for various times on a vitamin-free one. In the latter the liver lost its vitamin A. Rats were given

about 10 larvae per gram of body weight. In vitamin-fed rats the life of the female trichinella is limited to about 2 weeks, but in the vitamin A deficient animals they survived for as long as the host lived, usually 4 to 6 weeks, a fact which probably accounts for the large numbers of larvae which developed in the muscles of these animals. While controls were immune to a second infection, deficiency rats were not

C. L.

AUGUSTINE (Donald L.). **Experimental Trichinosis in Chicks.**—Reprinted from *Science*. 1933. Dec. 29. Vol. 78 No 2035. pp. 608-609.

Trichinal cysts have been found consistently but sparsely in all chicks fed with thousands of isolated trichinella larvae

Such cysts have never been found on microscopic examination, but have been isolated in all cases by artificial peptic digestion of the muscles. This was undertaken at 45 to 54 days after the date of infection, and at that time all isolated larvae were dead. Their life there must then be short so that it is doubtful whether infection can occur from this source. Since they have never been found *in situ* their method of destruction is unknown

C. L.

SEMEANOVA (N. E.). **Trichocephalosis und ihre Behandlung mit Osarsol. [Treatment of Trichuriasis by Osarsol.]—*Med. Parasit. & Parasitic Dis* Moscow 1933 Vol. 2 No. 3 pp. 149-151. [In Russian. Germany summary p. 151]**

Semenova regards osarsol treatment of trichuriasis as the most effective method known at present. Osarsol (a Russian brand of stovarsol) was used with methylene blue as follows 0.15 gm methylene blue 2-3 times per diem for 2 days, osarsol tablets (per 0.25 gm.) in increasing doses from 3 to 6 tablets per diem during 4 days (a total of 16 to 20 tablets). This course of treatment was sometimes repeated at intervals of one month. The total number of cases treated was 102. Total disappearance of ova was observed in 75 per cent. of cases, systematic examination of the faeces being continued from 3 to 21 months after treatment.

C. A. Hoare.

LI (H. C.) **On the Mouth-Spear of *Trichocephalus trichiurus* and of a *Trichocephalus* sp. from Monkey, *Macacus rhesus*.**—*Chinese Med. J.* 1933. Nov.-Dec. Vol. 47. Nos. 11-12. pp. 1343-1346. With 2 figs. on 1 plate.

Li describes and figures a structure in the mouth of *Trichuris trichiura* and in a trichuris from *Macacus rhesus*, which he identifies as the spear-head described by FULLEBORN [this *Bulletin*, Vol. 21, p 219]. He could form no clear conception of a shaft.

C. L.

FITZWILLIAMS (Duncan C. L.). **Fistula-in-Ano, caused by the Ova of *Oxyuris vermicularis*.**—*Proc Roy. Soc. Med.* 1934. May. Vol. 27. No. 7. pp. 932-934 (Sect. Surgery pp. 26-28). With 2 figs.

An ischio-rectal abscess repeatedly discharged and healed over in a youth of 17 who had had threadworms since childhood. When its lining granulation tissue was cut away and examined under the microscope, enterobius eggs were found in it, and quassia washes removed numbers of adults from the bowel. As the title shows it is concluded that the eggs caused

the abscess; [the alternative, that the females, having as usual left the anus, crawled into the abscess on one of the occasions when it was open and there oviposited, is not mentioned]. C. L.

HU (Stephen M. K.) & YEN (Chia-hsien). **Studies on the Susceptibility of *Culex pipiens* Linnaeus var. *pallens* Coquillett to Experimental Infection with *Wuchereria bancrofti* Cobbold in Shanghai Area.**—*Chinese Med. J.* 1933. Nov.-Dec. Vol. 47. Nos. 1 & 12. pp. 1359-1366.

— & CHANG (Teh-ling). **Observations on Natural Infection of *Culex pipiens* Linnaeus var. *pallens* Coquillett with *Wuchereria bancrofti* Cobbold in Woosung District, Shanghai, China.**—*Ibid.* pp. 1367-1372.

i. The susceptibility of *Culex pipiens-pallens* to *bancrofti* infection in the Shanghai area was as follows.

Of 88 females, which survived for more than 12 days after the infective feed, 55 per-cent. were proved infected. Of 48 infected mosquitoes in which the numbers of larvae were counted, 79 per cent. had 4 or fewer of these; the total number of larvae collected was 185, of which 30 were found in one mosquito, and the average number per mosquito was 3.9. In two more insects which became infected the larvae died before reaching maturity. The distribution of infective larvae within the mosquito suggested that their wanderings within her body did not necessarily take them at once to the head, so that larvae which escaped from the labium and head during a first feed would be replaced by others coming up from thorax and abdomen.

ii. Natural infection of this mosquito in Woosung was as follows. Six lots of *C. p. pallens* were collected from two rooms in which 2 of 6 inhabitants showed microfilariae in the night blood. The insects were taken to the Lester Institute, Shanghai, and there isolated in breeding chambers for 12 days (unless they died earlier) before dissection. The malpighian tubes were scrutinized to detect any trace of occupation by the larvae of *Dirofilaria immitis* since these were found to be indistinguishable from *Mf. bancrofti*. Of 245 mosquitoes, 12 contained infective larvae. The heaviest infection was with 75 larvae, the female concerned being a sick animal unable to fly. Other heavy infections were with 58, 47, 36, 32, 31, 27 and 23 larvae. The last was flying actively when killed. The embryo can, then, undergo complete development under natural conditions in this mosquito. C. L.

POINDEXTER (Hildrus A.) & JONES (R. Frank). ***Wuchereria (Filaria) bancrofti* Infection in Man with an Unusual History.**—*Jl. Lab. & Clin. Med.* 1934. May. Vol. 19. No. 8. pp. 864-869. With 2 figs.

This negro of 29 had lived all his life in Washington and fishing trips had never taken him more than 100 miles from there. He had been janitor to Filipinos in Washington whose possible infectivity is unnoted in the paper.

He had elephantiasis of the scrotum and right lower limb, enlarged axillary glands and microfilariae (substantiated by micro-photographs) in the night blood. The suggestion seems to be made that infective mosquitoes may have been conveyed with plants which were being constantly imported from the Philippines. It is stated that man is the intermediate and the mosquito is the only proved definitive host in which complete development may take place. C. L.

FENG (Lan-chou) **A Comparative Study of the Anatomy of *Microfilaria malayi* Brug, 1927 and *Microfilaria bancrofti* Cobbold, 1877.**—*Chinese Med. J.* 1933 Nov-Dec. Vol. 47. Nos. 11 & 12. pp. 1214-1246. With 6 text figs & 3 plates (1 coloured). [16 refs]

This study compares *Mf. malayi* obtained from Huchow in the Chekiang Province with *Mf. bancrofti* and *Mf. loa*.

	<i>Mf. bancrofti</i>	<i>Mf. malayi</i> .	<i>Mf. loa</i> .
Excretory cell	Smaller, very near to excretory pore, with 3 protoplasmic process extending posteriorward	Larger, far behind excretory pore	Similar to <i>malayi</i>
Excretory pore	Less distinct and smaller especially in hematoxylin stain	More distinct and larger	Similar to <i>malayi</i> ?
G cells— Shape and size	All 4 G cells are same in size, angular or round shaped with little cytoplasm, nuclei small	G1 cell is very large twice as large as the G1 cell of <i>bancrofti</i> . The G2, G3 and G4 cells also bigger than those of <i>bancrofti</i> , all oval in shape and rich in cytoplasm, nuclei larger	Similar to <i>malayi</i>
Relative position	G2 very far from G1, G4 near to, parallel with or sometimes behind the anal pore	G2 nearer to G1, G4 always before and well separated from anal pore	Similar to <i>malayi</i>
Anal pore ...	Much less distinct and smaller occupying only $\frac{1}{3}$ or $\frac{1}{4}$ the breadth of the width of the worm	Very distinct, larger, occupying more than $\frac{1}{2}$ and sometimes nearly whole breadth of worm	Similar to <i>malayi</i> ?
Tail	Tapering gradually to fine point, no nuclei	Swollen at the middle and tip, two nuclei found in the corresponding swellings	Tapering gradually, nuclei of the tail continuous with the nuclear column
General appearance— Attitude ...	Graceful large curves	Large curves complicated with secondary waves	Similar to <i>malayi</i> .
Cephalic space	Short, about half or as long as the breadth of worm	From $1\frac{1}{2}$ – $2\frac{1}{2}$ usually about 2 times as long as the breadth of the worm	Similar to <i>bancrofti</i> .
Nuclear column (hematoxylin stain)	Clear, nuclei round and well separated, space between nuclei stained lightly	Smearred, nuclei oval and entangled in mass, space between nuclei stained darker	Nuclei also oval.

The basis of the comparison rests on the finding that in preparations made in different ways microfilariae have different appearances. This material had by conditions of distance to be 5 days old, that from each of 24 cases of infection with *Mf. malayi* consisted of ten thick blood smears and a bottle containing 5 drops of blood in 5 cc of 5 per cent. formalin. Similarly *Mf. bancrofti* was examined in like material from Woosung, Shanghai and elsewhere. The staining recommended is by methyl green pyronin in which smears dehaemoglobinized in normal saline lie for 5 to 15 hours. They are then passed through alcohol—70 per cent 5 seconds, 85 per cent 10 seconds, 95 per cent. 15 seconds, absolute 20 seconds and again 1 to 3 minutes—cleared in xylol and mounted in balsam or cedar oil ringed with balsam. The fundamental and characteristic differences are in the excretory cell and pore, the G cells, the anal pore and the tail, and this extract from a table sets them out, FULLEBORN's data for *Mf. loa* being also included.

It is pointed out that *Mf. malayi* is structurally near to *Mf. loa* except for its tail, and it is agreed that the former probably belongs to a distinct species whose adults must, however, be found before this point can be definitely settled. [It should be easy to obtain them on F. W. O'CONNOR's lines of glandular excision.] C. L.

STRAHAN (J. H.). Notes on the Incidence of Filariasis in Province Wellesley North.—*Malayan Med. Jl.* 1934. June. Vol. 9. No. 2. pp. 44-47. With 1 map.

Filariasis, with *Mf. malayi* in the night blood predominantly, exists on sand dunes overlooking the sea in the north-west corner of this Province, and no previous record of its presence was discoverable.

A house-to-house survey discovered elephantiasis of the leg, the only clinical sign, in 58 of 4,476 persons examined. A cinematograph film illustrating hookworm, malaria, tuberculosis and child welfare work brought together 1,000 people but there were only 7 volunteers for a blood examination. However, the discovery and microscopical display of wriggling microfilariae in the night blood of the headman proved a welcome impetus and 34 males showed an infection rate of 23.5 per cent. The microfilaria was identified as *Mf. malayi* by SANDOSHAM, LEIPER and BRUG. No infected mosquitoes have been found. The villagers believe that elephantiasis cases are becoming more numerous.

C. L.

DRINKER (Cecil K.), FIELD (Madeleine E.) & HOMANS (John). The Experimental Production of Edema and Elephantiasis as a Result of Lymphatic Obstruction.—Reprinted from *Amer. Jl. Physiol.* 1934. June. Vol. 108. No. 3. pp. 509-520. With 6 figs.

By centripetal injection of irritants into the lymphatic trunks of the dog's leg there have been produced in dogs oedema, elephantiasis and attacks of acute infection caused by a haemolytic streptococcus.

A lymphatic having been exposed there was injected into it through a quartz canula first about 2 to 4 cc. of a watery suspension of crystalline silica with an average particle size of 1μ , and secondly over 10 minutes the same quantity of a 2 to 2.5 per cent. watery solution of quinine hydrochloride, the latter being repeated once and if possible twice at half-hour intervals. The silica causes the appearance in the sinuses of the next lymphatic node of characteristic large pale cells,

undoubtedly arising from the endothelium of the reticulum and wall of the sinus and producing fibrosis. The quinine painlessly scleroses lymphatics as effectively as it does varicose veins. In 3 cases given in detail the numbers of such duplicated injections were 7, 9 and 13. As the result of these repeated injections there appear oedema of the leg, elephantiasis, and spontaneous attacks of acute generalized superficial inflammation of the leg, early in which a haemolytic streptococcus can be isolated for a short time. These attacks last about 48 hours and are clinically similar to those associated with elephantiasis in man; and the resultant lymph is very rich in proteins, half as rich as plasma and having the same albumin-globulin ratio, and contains poorly staining leucocytes. "Such a medium provides excellent growth of connective tissue cells *in vitro* and is, perhaps, the cause of the elephantiac changes observed in our animals." When these acute attacks were present elephantiasis was rapidly produced, but it could occur without them. They appeared with no local lesion, and they were also induced by injecting into a dog, who had already been subjected to fibrosing injections, streptococci obtained from another dog during a spontaneous attack. Streptococci have not been obtainable from dogs between the acute attacks. [The resemblances to the effects of human filariasis are very striking.] C. L.

PAINE (R. W.). *The Introduction of Megarhinus Mosquitos into Fiji.*—*Bull. Entom. Res.* 1934 Mar. Vol. 25. Pt. 1. pp. 1–32. With 1 text fig & 3 figs. on 1 plate.

Aedes scutellaris (variegatus) is probably the only vector of filariasis in Fiji and Polynesia. Its control is extremely difficult, for it breeds in small cavities in trees, half coconut shells, etc. The harmless mosquito, *Megarhinus*, has been introduced from Java as a measure of natural control: its early stages are passed in rather similar places, and the larva is predaceous.

Mosquitoes of the genus *Megarhinus* have no direct relation to public health, for they do not suck blood, but their predaceous larvae have perhaps some value. These insects are forest dwellers, putting their eggs in rot-holes in trees, water in broken bamboos, and similar places. The larvae are general predators, feeding on any small animal in the water and frequently eating large numbers of mosquito larvae. The author made full studies on the biology of *M. splendens* in Java. The larvae of this insect are found not only in the forest, but also in barrels, etc., in villages. They resist prolonged starvation, but under these circumstances the mortality among the pupae is very high. It is, however, possible to retard larval growth (without undue effects on the pupae) by rationing them to two *Culex* larvae per week. After making studies in Java, the author left with 283 larvae and arrived a month later (February 1931) with 238 alive, a result upon which he may surely be congratulated.

In Fiji the early stages were liberated in tubs under a great tree, for it had already been found that the insects would not pair in cages. From this colony other colonies were founded here and there in Fiji as opportunity occurred, and in spite of the fact that 3,000 individuals were taken away and put down in more than 50 places, the original colony was still flourishing after 15 months. Many of the daughter colonies were well established and had been in existence for a year, which corresponds to about a dozen generations. The actual spread of

the insects in one locality was studied from time to time in detail. It was found that the insects spread slowly through forest, colonizing only a certain type of large cavity in trees. They successfully crossed a bare gap of 150 yards, but were held up at one place apparently because they were unwilling or unable to fly through dense undergrowth.

The author describes the benefit which Fiji may perhaps derive from this introduction. *Megarhinus splendens* breeds and spreads slowly; it will only colonize rather large cavities, though in these it is evidently very successful in controlling larvae of *Aedes*. On the other hand, it breeds all the year round and has apparently no enemies in Fiji, and it is colonizing tubs, etc., on the edge of villages. It seems unlikely that it will produce a great reduction in the numbers of *Aedes scutellaris*; the author thinks that it may perhaps reduce them by 5 per cent. On the other hand, the introduction cost the Colony almost nothing, for the author was travelling in pursuit of a different beneficial insect and his work on *Megarhinus* was incidental. Moreover, the maintenance and spread of *Megarhinus* in Fiji is easy and costs nothing.

[The reviewer has hoped for some years to see this introduction attempted, and is glad to read the results which are recorded in an interesting but rather diffuse paper. It is clear that the insect is established and that it may spread to all parts of Fiji except one dry area. Moreover, it would now be easy to introduce it to nearly all parts of Polynesia, throughout which *Aedes scutellaris* is so important as the vector of filariasis.]

P. A. Buxton.

CHOPRA (R. N.), MUKHERJEE (S. N.) & SUNDAR RAO (S.). **Studies on the Protein Fractions of Blood Sera. Part I. Normal and Filarial Blood Sera.**—*Indian J. Med. Res.* 1934. July. Vol. 22. No. 1. pp. 171–181. With 3 charts [24 refs.]

The following conclusions were reached:—

"The protein fractions have been estimated for normal sera under different conditions and it has been shown that different observers get different values for the globulin:albumin ratio possibly due to the different conditions of experiment, viz., temperature, concentration of the electrolyte and the actual conditions of precipitation.

"Following Robertson's method it has been found that the globulin to albumin ratio agrees fairly well with those obtained by Lloyd and Paul (1929) [*this Bulletin*, Vol. 27, p. 561].

"The total globulin, especially euglobulin, in filariasis patients increases while albumin decreases to a certain extent in consequence of which the globulin to albumin ratio is found to increase.

"The physical properties such as surface tension, viscosity and buffer action of sera from filarial blood change very little if at all. What this is due to cannot be definitely ascertained, until all the serum constituents be determined in such cases."

C. L.

BUCKLEY (J. J. C.). **Development of *Filaria ozzardi* in *Culicoides furens*.** [Laboratory Meeting Demonstration.]—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934. June 30. Vol. 28. No. 1. p. 1.

The demonstration showed the development of *F. ozzardi* in this sandfly both by stained celloidin sections and by *in toto* mounts of larvae freed by dissection. Infection took place in St. Vincent, B.W.I., the time for completion of development in the fly being 8 days.

C. L.

CONNAL (Andrew) Calabar Swellings.—*West African Med. Jl.* 1934 Jan Vol. 7. No 3 pp. 113-117.

A description of the disease based on analysis of 45 cases in Europeans and 70 in native Africans met with in Nigeria, most of the former having been under observation for a period of years

The point is made that the average patient does not take his ailment so seriously as to complain officially and thus may spend several tours of service in the fly area, while a lady missionary wrote "While busily at work, the swellings were regarded as an irritable nuisance, and little note was taken of the time of their occurrence." The site incidence of the swellings is detailed; in no case did suppuration follow. The worm visited the eye by day in 16 cases, by night in 6, while in 7 there was no periodicity, and these visits may continue after the swellings have quite ceased, in one case for 8 years. Appearance under the skin of other parts was noted in 22 cases, but in the individual case such visits were rarer than about the eye, nor was more than one worm thus evident at the same time. It is noted that Glen LISTON has devised a method, as yet unpublished, of concentrating the embryos from 5 to 10 cc. of blood, and that this will assist in reducing negative findings. Comment is made on the scanty knowledge of the pathology of the infection, and the report by KLOTZ is quoted [this *Bulletin*, Vol. 28, p 217]. "At the Medical Research Institute, Lagos, from 1909 to 1931, most of the specimens of *Loa loa* received were from operations on the abdomen. Actual figures are not available, but it may be stated that, with very few exceptions, all the specimens were male, and no females were observed among those obtained from the eye." FAIRLEY's complement fixation and intradermal tests are mentioned with enthusiasm. Microfilariae are most numerous in the peripheral blood about midday. T. B. ADAM's observation is quoted, namely that by rest and darkness the movements of a worm appearing about the eye may be slowed down, and a surgeon may be summoned in time to catch it with forceps or transfix it with a suture in the uncoincided conjunctiva, for to instil cocaine causes its prompt disappearance. "The fate of such embryos as do not gain access to the fly (and they must be innumerable) and the length of time they can survive in the human body are . . . unknown . . . Dissection of over four thousand Chrysops has shown that both large and small infections occur in the fly." C. L.

MARCHAL (Georges) & LEMOINE (J.). Filariose avec grande éosinophilie sanguine et insuffisance cardiaque. [*Filariasis with Blood Eosinophilia and Cardiac Insufficiency*.]—*Bull. et Mém. Soc. Méd. Hôp. de Paris*. 1934. May 21. 50th Year. 3rd. Ser. No. 16. pp. 665-671.

When this man came under observation he had marked oedema, dyspnoea, enlarged spleen, an eosinophilia of 73 per cent. with leucocytes 35,200 to the cmm. but no microfilariae.

He had had in the Cameroons a loa infection attested by Calabar swellings and microfilariae in the blood. In France under calcium chloride and local X-rays over the spleen his cardiac symptoms disappeared though the eosinophilia persisted. Another case of cardiac insufficiency is cited, with death, the post-mortem microscopic appearances being described, it being held pertinent because he "had passed

20 years in Tonkin in areas infected with filariasis (*filaria loa*).” [This last statement will not increase confidence in the conclusion that loa had an essential part in the causation of the cardiac insufficiency of the first.] C. L.

D'HOOGHE (M.). Contribution à l'étude de l'onchocercose humaine dans l'Uele. [**Human Onchocerciasis in the Uele District, Congo Belge.**]—*Ann. Soc. Belge de Méd. Trop.* 1934. June 30. Vol 14 No. 2. pp. 153–180. [18 refs.]

A close study has been made of 6 cases of onchocerciasis in Europeans. As in the natives, the nodules specially affect bony prominences and principally the iliac crests, so that it is difficult to implicate the actual biting of simulum as determining their sites. The prurigo from which 3 of them suffered is correlated with allergy due to diffusion of antigen, and not with microfilariae, since these may be present where there is no prurigo and absent where there is. Periodically the nodules become engorged and tender, and this is attributed to massive discharge of embryos and of antigen with them. Fresh extracts of onchocerca gave positive intradermal reactions in 4 cases as well as in 4 persons harbouring *Loa loa* C. L.

STEWART (J. S.). *Onchocerca cervicalis* (Railliet and Henry 1910) and its Development in *Culicoides nubeculosus* Mg.—*Univ. of Cambridge. Inst. of Animal Path. (3rd Rep.)*. 1932–33. pp. 272–284. With 24 figs. (18 on 9 plates). [Summarized in *Vet. Bull.* 1934. July. Vol. 4 No 7. pp. 472–473.]

“Steward describes the adult male and female *Onchocerca cervicalis* (Railliet and Henry 1910), from a case of fistulous withers in a horse in Herefordshire. Embryonated eggs were obtained from the cut ends of a female. Microfilariae measuring from 160 to 200 μ long and 2 to 4 μ wide were subsequently found in the skin of the horse from 8 a.m. to 6 p.m. in April. In the search for a possible vector, 300 simuliids were dissected for microfilariae after they had engorged on an affected animal. . . . They were all negative with the exception of one specimen of *S. morsitans* which contained a dead and disintegrating microfilaria.”

“In May, 1932, various species of *Culicoides* were found feeding on the affected horse between 7 p.m. and 10 p.m. Of 172 specimens of *C. obsoletus*, nine were found to harbour living microfilariae. *C. parroti* and *C. nubeculosus* were also found to be infected. As the latter species could be obtained in large numbers, it was used for experimental purposes. . . . Microfilariae, on being taken up in the blood by the midge, pass into the midgut and 48 hours after ingestion they measure 210 μ long by 5 μ wide. Seven days after feeding, the microfilariae are found in the thoracic muscles and measure 133 to 240 μ long by 17 to 27 μ wide. About the 20th day, the microfilariae migrate towards the head of the insect where they arrive on the 22nd day and may then be found in the proboscis: they now measure from 600 to 700 μ long and 18 to 21 μ wide. . . . Between 5 and 6 per cent. of midges, dissected within 24 hours of feeding on the infected horse, harboured microfilariae, the largest number in one fly being 26. 126 control midges fed on a pony shown to be free from microfilariae were all negative. . . . The author states that whereas, according to Blacklock, *Onchocerca volvulus* of man takes seven to eight days to pass through its development in *Simulium damnosum* in tropical West Africa, *O. cervicalis*

takes 24 to 25 days to do the same in this country in *Culicoides nubeculosus*. He is of opinion that possibly other species of *Culicoides* may act as vectors "

VAN HOOFF (L). **Serological Reactions in Onchocerciasis.**—*Trans. Roy Soc Trop Med. & Hyg.* 1934. May 9. Vol. 27. No. 6 pp. 609-617 [10 refs.]

Using as antigen an alcoholic extract of tissue rich in *O. volvulus*, there is obtained, it is held, a specific and not a group serological reaction.

Freshly excised onchocerca nodules, freed from any stringy purulent contents and from all tissue not rich in worms, are sliced thin, completely dried over sulphuric acid, and extracted with ether at laboratory temperature (mean 25°C.). The ether is frequently renewed, even 3 or 4 times a day, till a few drops leave no residue. The ether is got rid of by drying in air on a plate at a temperature not higher than 45°C. till there is no ethereal smell. One part of the dried mass is soaked in 5 parts of 90 per cent. alcohol at 25°C. for at least ten days and run through filter paper before use.

Titration is as described by CALMETTE, NIGRE and BOQUET, the technique was that of Calmette and Massol, and the best results were obtained without adding cholesterin and with a titre of at least 8 per cent. In serum the method has failed to give a positive reaction in 12.5 per cent. of cyst carriers, even when microfilariae have been displayed on puncture, but has never given a positive reaction when there have been no "visible or palpable *O. volvulus*." Positive reactions have also been obtained with cerebrospinal, synovial and oedematous fluids. Results are not vitiated by infections with *L. loa*, *A. perstans*, hookworms, ascaris, or trichuris. After cysts have been treated with atebirin and excised, the patients have continued to give reactions. "The test will undoubtedly be of assistance in enabling a definite opinion to be formed regarding the exact etiology of lesions and affections caused by toxins or by embryos migrating from filarial cysts."

C. L.

MIRA (Mario Giaquinto). Sulla presenza delle microfilarie di "*Onchocerca coecutiens* Brumpt" nel nervo ottico. [**The Presence of Microfilariae of *Onchocerca caecutiens* in the Optic Nerve.**]—*Riforma Med.* 1934. June 2. Vol. 50. No. 22. pp. 858, 861.

The demonstration of microfilariae in the optic nerve itself is believed to be a new observation in this infection.

A young man of 21, a native of Guatemala, was operated on in 1928 for an onchocercal occipital tumour without affection of the eyes. In 1930 a fresh tumour appeared with photophobia, lessened vision and an erysipelatous condition. In 1932 another occipital tumour was removed with benefit to vision, but 4 more nodules appeared and by August 1933 vision of the right eye was completely lost with occlusion of the pupil and that of the left impaired. Accordingly the right eye was enucleated and in the stump of the optic nerve microfilariae were present. It is felt that when there is in such cases blindness with little damage to cornea or iris the injury is probably in the optic nerve, and that this case stresses the urgent need for some chemical which will kill the worms so that all treatment need not rest on their surgical removal.

C. L.

GIBBINS (E. G.). **Further Studies on Ethiopian Simuliidae.**—*Trans. Roy. Entom. Soc. London.* 1934. June 30 Vol. 82 Pt 1. pp 51-97. With 1 map and 41 figs [13 refs.]

Flies of the genus *Simulium* are of considerable importance in Africa, for one of them is the proved vector of *Onchocerca volvulus*. The adults are frequently difficult to breed, and it is important to know the specific characters of larvae and pupae which are easy to collect.

It seems that there are rather more than thirty species of *Simulium* at present known from Africa. The author gives a full illustrated account of nine of them, all from East Africa. He describes the adults of both sexes, the larvae and the pupae, and he gives notes on breeding places. Some of the species breed in the water of mountain torrents, others in sluggish streams provided they are cool. If pupae are kept in damp air, the adults may frequently be reared. The paper describes a convenient way of doing this, the pupae being fixed to a strip of surgical lint inside a test tube or other vessel which contains a little water at the bottom.

P. A. Buxton

JOURNE (H.). Contribution à l'étude des arthrites puriformes au cours de la draconculose. [**Puriform Arthritis in Guinea Worm Infection.**]—*Bull. Soc. Path. Exot.* 1934 June 13 Vol 27. No. 6. pp. 588-590.

Guineaworm can produce septic arthritis while the skin is intact.

A man from Togo was admitted to the Lomé Hospital with a purulent arthritis of the right knee and with numerous Gram positive cocci in the fluid. About a month after the primary incision a guineaworm presented through the wound, having presumably been instrumental in introducing the bacteria. There followed marked ankylosis of the knee joint.

C. L.

Hsü (H. F.) & WATT (John Y. C.). **Dracunculus medinensis Infection in Two Dogs in Peiping. Experimental Infection of Cyclops.**—*Chinese Med. J.* 1933. Nov.-Dec. Vol. 47 Nos 11 & 12. pp. 1326-1330.

The infected dogs were 12 and 13 months old, had been born in Peking and had never left it. In one, four worms developed, in the other, one. The larvae began development in *Cyclops leuckarti*, *C. magnus*, *C. serrulatus* and *C. ternis*, but all the cyclops died before it was complete. Guineaworm has never been reported in man in Peking and only once there from the tarsus of a horse.

C. L.

BENYAMINE (Georges). L'anquilostomose en Afrique du Nord. [Thesis University of Algiers.]—77 pp. With 1 fig. [7 pages of refs.] 1934.

BIBLIOGRAPHY OF HELMINTHOLOGY FOR THE YEAR 1932. Compiled by A. WALTON from Titles selected by R. T. LEIPER. 1934 Mar. 97 pp. St Albans: Imperial Bureau of Agricultural Parasitology, Winches Farm Drive, Hatfield Road.

COTTI (Luigi). Su un caso di anemia perniciosa pseudoaplastica in corso di anchilostomiasi.—*Haematologica.* Pavia 1934. Vol. 15. No. 4. pp. 327-353. With 3 figs. [47 refs.] French summary p. 353.

DUPONT (Robert). Un cas de vers de Guinée observé en France.—*Rev. Med. et Hyg. Trop.* 1934. Mar.-Apr. Vol. 26. No. 2. pp. 96-99.

- FRÓES (Heitor P) Sobre um caso invulgar de infestação pela *Wuchereria bancrofti* em que fôram reiteradamente encontrados embriões filarios em liquido acitico sero-fibrinoso—Reprinted from *Bahia Medica* 1933 June No 6 11 pp
- FRÓES (H P) On a Very Rare Case of Bancroftosis (Bancroft Filariasis). Summary and Conclusions—*Jl Trop Med & Hyg* 1934 June 15 Vol 37 No 12 pp 183-184
- GIRGES (Rameses) Schistosomal Secondary Anaemia in Egypt Youth's Insidious Enemy—*Jl Egyphian Med Assoc* 1934. Mar Vol 17 No 3. pp 273-284
- MOLINA (Rafael Rodriguez), HOFFMAN (William A) & ROJAS (Eli S) Aplicacion del tubo duodenal para el tratamiento de la teniasis—*Bol. Asoc Med de Puerto Rico* 1934 Feb. Vol. 26 No 2 pp. 57-59
- MUSGER (Anton) Ueber Hauterscheinungen bei Trichinose—*Dermat Ztschr.* 1933 Nov Vol. 68 No 1/2. pp. 34-39 With 1 text fig
- PARDINA (José M) Parasitosis apendicular en Córdoba—*Semana Méd.* 1934 July 19 Vol 41 No 29 (2114) pp 210-214 With 5 figs. [22 refs]
- ROBATTO (Angel G) La filariosis en el Africa occidental Sobre el tratamiento incruento de los abscesos filariosicos—*Medicina Paisés Cálidos* Madrid. 1934 July Vol 7 No 7. pp 331-335 [23 refs]
- RONKA (Ensio K F) Infestation with *Diphylllobothrium latum*. Fish Tapeworm—*New England Jl of Med* 1934 Mar 15 Vol. 210 No 11. pp 582-583
- SANDOSHAM (A A) The Treatment of Intestinal Helminthic Infestation: a Review—*Malayan Med. Jl* 1934 Mar Vol 9 No 1 pp 55-64 [63 refs]
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MISCELLANEOUS.

CRÓNICA MÉDICO-QUIRÚRGICA DE LA HABANA. 1933 Dec. Vol 59. No. 12. pp. 477-521. Número Especial dedicado al Centenario del Natalicio del Dr Carlos J. Finlay. [Finlay Centenary Number.]

The December issue of this journal is dedicated to the memory of Dr. C. J. FINLAY, whose birth took place on December 3rd, 1833, and does homage to a great man whose need of praise has generally fallen short of his just due, except, strange to say, in his own country.

Dr. Juan GUTIERAS contributes a brief biographical sketch. Dr. Finlay was baptized Juan Carlos, but called himself and was always known as Carlos until his son Carlos Eduardo started to practice medicine when the father adopted the J. (Carlos Juan Finlay) to distinguish between them. His education as a boy in France at Le Havre, and later at London and Rouen, and his final qualification from the Jefferson Medical College, Philadelphia, and his return to Cuba are noted and the main facts of his life which are probably known to all readers of this *Bulletin*.

This Centenary number has as a frontispiece a portrait of Dr. Finlay, but it has lost clarity in reproduction. It contains also the original article, read before the Academy of Science at Havana on 14th August 1881, in which he marshalled the evidence incriminating the mosquito (at that time called a *Culex*) as the transmitting agent of yellow fever. It is of the highest interest even now. He tells also of the experimental work which he undertook to confirm his hypothesis.

Another section is devoted to aphorisms or extracts from Finlay's papers and manuscripts in the course of 25 years, from 1881 to 1906.

Colonel Roger BROOKE, of the United States Army, contributes an appreciative article (here translated into Spanish) which he delivered at the Commemoration Session held at Washington and this is followed by another by Dr. L. O. HOWARD, of the United States Bureau of Entomology, on the Importance to Man of the Discovery of the Insect-Transmission of Disease.

It is perhaps not generally known that in 1902 Dr. THEOBALD proposed that the name *Stegomyia fasciata* might be changed to *S. finlayensis* in honour of Dr. Finlay, but the laws of nomenclature could not be thus set aside, though these same laws have now relegated the former to become an *alias*. Finlay was also proposed in 1905 for the Nobel Prize, but it was ruled that the work had been done at too remote a time.

In conclusion we may say that this issue of *Crónica Médico-Quirúrgica de la Habana* is one of considerable interest as a small tribute to one who has always been held in honour and his work in grateful remembrance in Cuba.

H. H. S.

PROCEEDINGS OF THE ROYAL SOCIETY OF MEDICINE. 1934. May. Vol. 27. No. 7. pp. 865-876 (Sect. Trop. Dis. & Parasit. pp. 31-42).—Discussion on Some Aspects of Intestinal Diseases of European Children in the Tropics [MANSON-BAHR (P. H.); MAITLAND-JONES (A. G.); MACKIE (F. P.); WATSON (Malcolm); FINDLAY (Leonard); WRIGHT (H. W. S.)].

Dr. MANSON-BAHR regards *Bacillary Dysentery* as "the most formidable and pernicious visitation in European children in the Tropics."

It runs a more acute and severe course than it does in native races. Signs of toxic absorption may overshadow the bowel symptoms. The stools may be diarrhoeic rather than mucosanguineous. Most cases are caused by the Flexner group of organisms, but in Egypt Sonne's bacillus is mainly responsible. Treatment is considered at length. Antidysenteric serum is considered to be of importance, given in sufficient amount and early; he advises 10-20 cc. by the intramuscular route at the outset. *Amoebiasis* is a rare disease in European children. MANSON-BAHR has never seen or treated a genuine case of amoebic dysentery in a child under 10 years of age [see this *Bulletin*, Vol. 30, p. 22 where the age given is five years]. It should be diagnosed only with great circumspection because emetine may have grave effects in young children. In non-European children in India and Egypt it is not rare. He writes—"I am constantly having small cachectic and emaciated children brought to me who are obviously suffering from emetine intoxication, the emetine having been given on the mistaken notion that they are suffering from amoebiasis."

Giardiasis.—MANSON-BAHR thinks that of the intestinal flagellates *G. intestinalis* has the strongest claim to be considered pathogenic. The symptoms resemble those of coeliac disease—persistent diarrhoea, abdominal enlargement and retardation of growth [see MILLER, this *Bulletin*, Vol. 23, p. 679]. *Coeliac disease* is not rare in European children from Malaya and India. It is suggested that defective fat assimilation with maldigestion of carbohydrates has much to do with the uncontrolled temper of European children in the tropics. *Sprue* in children is very rare. *Polypos* is often mistaken for dysentery. A form of *idiopathic ulcerative colitis* in children under ten is similar to the disease in adults. *Tuberculous ulceration of the colon* is not uncommon, the bacilli are difficult to detect. *Worm infestations* are also discussed.

Colonel MACKIE said that of all the diseases of children in the tropics bacillary dysentery was most to be feared. Shiga must be distinguished from Flexner dysenteries, he agreed that the great majority of dysenteries in children were bacillary. He disbelieved in the pathogenicity of *Giardia*.

Mr. H. W. S. WRIGHT said that in North China bacillary dysentery in children had a 50 per cent. fatality. Scarlet fever also was a fatal disease, being associated with a very virulent haemolytic streptococcus; early blood transfusion from a previously infected child or adult was the best remedy. Speaking as a surgeon he said it was impossible to over-emphasize the importance of ascaris infection in obscure abdominal conditions and gave instances. In reply to a question by Dr. MAITLAND-JONES Sir Malcolm WATSON said that in Malaya he advised parents to keep their children there till ten years of age.

[Much of this discussion was concerned with children's diseases as seen in Great Britain.]

A. G. B.

TEICHLER (G.). Einige Notizen zur Formalinprobe im Blutserum. [Notes on the Formalin Serum Test.]—*Arch. f. Schiffs- u. Trop.-Hyg.* 1934. June. Vol. 38. No. 6. pp. 255-257.

The very simple formol-gel serum test is not employed to the extent it might be. It can be useful especially to the practitioner in the tropics, who for the most part is deprived of the advantage of the Wassermann reaction and of X-ray investigation. This test consists in the addition of one drop of commercial formalin to $\frac{1}{2}$ to 1 cc. of test serum and

watching for the formation of a gel, after 1, 4, or 24 hours. The reaction was tested in 280 cases of diagnosed disease and gave positive results in tuberculosis, leprosy, syphilis and yaws Kala azar, in which the reaction is positive, does not occur in East Africa. There is also a positive reaction in cases of bilharzia infection, but this disease presents no difficulty in diagnosis. In other diseases the reaction was negative. There is help then to be obtained from the formalin test, although it is in no way specific.

W F Harvey.

VELHO-DA-SILVA (J.) & PONTES (José P. L.). Estados vesiculares determinados por parasitas aninaes. Cholecystopathias por *Lambliia* e *Strongylus*. [Animal Parasites in the Gall-Bladder.]—*Brasil-Médico*. 1934. Jan. 13 Vol. 48 No. 2 pp. 28-31

In this short article the authors describe eight cases. Six of the patients, whose ages ranged between 20 and 42 years, presented symptoms of cholecystitis—gastric discomfort, anorexia, nausea, at times vomiting, occasional paroxysmal pains in the right hypochondrium and jaundice. The duodenal sound was passed and in the bile were found numbers of *Giardia lamblia*. [The author speaks of Bile A which might show none, and Bile B in which they were numerous, but does not state what he implies by these terms] In another patient the parasites were found, but there had been no symptoms. In yet another, there were numerous specimens of *Strongylodes stercoralis* [not strongylus, as stated in the title of the paper] but no *Giardia*.

H. H. S

MERTENS (W. K.) & VAN VEEN (A. G.). Recherches sur la cause d'un empoisonnement fréquent chez les Javanais. [A Frequent Cause of Poisoning in Javanese.]—*Bull. Soc. Path. Exot.* 1934. May 9. Vol. 27. No. 5. pp 488-490

The intoxication in question is the cause of numerous deaths in Java. It is characterized by its fulminating course, the preponderance of nerve symptoms and the absence of gastro-intestinal symptoms.

It is produced by the ingestion of coconut, or food prepared therewith, when it has been in contact with air, prepared the day before and in part freed from fat, and occurs as a rule after the eating of coconut "cake," the residue of the preparation of oil among the primitive folk. It does not occur in the factories, the residues of which contain little oil. The cause is a microbe which the authors have isolated and call "*Bacillus cocovenenans*." This organism forms with coconut oil a virulent poison, the fatal dose of which by mouth is 0.5 mgm. It is a saprophytic rod, not staining by Gram, strongly motile, very resistant to desiccation, developing well on all artificial media, even anaerobically, but producing the poison only on certain media. The oil is decomposed by it into a glycerine and a fatty acid fraction. The poison has been isolated, it is not a toxin in Pasteur's sense, it has the formula $(C_6 H_6 N_4 O_2)_x$ and has been named toxoflavine, because it belongs to the flavine group. Its properties are analogous to that of one of the fractions of Vitamin B₂. An analogous poisoning is that of ergot of rye, in which *Claviceps purpurea* produces the poison.

The symptoms may appear in 4 hours. The patient complains of malaise, and of abdominal pains and meteorism at the pit of the stomach. He becomes dizzy and has to lie down. He is pale and sweats. His

fatigue increases and he desires sleep. Paraesthesiae may appear and coma supervene with death in 6 to 10 hours. If he does not become comatose he may recover but even then he may die suddenly. The incubation may be prolonged to 44 hours. The duration is from 24 hours to 2 days. During coma he has tonic-clonic convulsions and he grinds his teeth, the eyes are open and the pupils strongly dilated. Clinical examination reveals no lesion, nor does autopsy. The authors suggest that this form of poisoning may occur elsewhere, e.g., in the French Colonies [This is the so-called bongkreik poisoning. See *Bulletin of Hygiene*, Vol. 9, pp. 551 & 552.] A. G. B.

- i. SOUCHARD. Remarques sur le diagnostic de la mélioiidose [**Diagnosis of Melioidosis.**—*Bull. Soc. Path. Exot.* 1934. Mar. 14. Vol. 27. No. 3. pp. 233-234.
- ii. PONS (R.). A propos du diagnostic de la mélioiidose —*Ibid.* May 9 No. 5. pp. 473-475.

i. Apropos of a claim made by PONS of priority of record of cases of melioidosis in Cochin-China the author contests the claim on the ground that the diagnosis was serological and that for the recognition of this infection in life it is necessary to isolate the bacillus either by culture or inoculation; sero-diagnosis is not of service. He cites STANTON & FLETCHER in support of this opinion.

[STANTON and FLETCHER write: "A trustworthy diagnosis of melioidosis can be made only by cultivation of the causative organism. . . Agglutination tests are of little practical value" "Melioidosis." 1932. Studies from the Institute for Medical Research, Federated Malay States. No. 21.]

ii. Reasoning that serological evidence is admitted for the presence of other diseases, such as typhoid and yellow fever, PONS maintains his position. A. G. B.

SCHWETZ (J.) & KADANER. Sur une épidémie mystérieuse observée, en 1932, parmi les Européens de Stanleyville (Congo belge) et en relation avec un bassin de natation [**A Mysterious Swimming Pool Epidemic among Europeans at Stanleyville.**—*Bull. Soc. Path. Exot.* 1934. Apr. 11. Vol. 27. No. 4. pp. 354-364.

In this epidemic definitely related to the opening of a swimming pool at Stanleyville, Belgian Congo, the diagnoses considered were enteric fever, dengue, leptospirosis, yellow fever; no conclusion is reached, but leptospirosis appears to be most probably correct.

The pool was made early in 1932 and opened in March using the overflow of a reservoir. It is noted that the water was renewed very slowly, 6-7 days being required when the pool had been emptied. In May 6 Europeans fell ill, all assiduous bathers. The bath was then emptied, but two months later it was again brought into use and there was another outbreak, 7 bathers being admitted to hospital, one of whom died. The pool was closed in August and in the 6 succeeding months there were no similar cases.

After a period of malaise and lassitude the temperature rose rapidly to 39.5° and 40°; there was pronounced weakness, headache, musculo-articular and retro-ocular pains, tenderness of the posterior cervical glands and usually the axillary, pulmonary congestion with dyspnoea; on the 3rd-4th day cessation of symptoms, then a return and another rise of temperature lasting 2 days, followed by a morbilliform or scarlatiniform evanescent rash, and subicterus of the conjunctiva with

a trace of albumin in the urine; in the second febrile period the pulse (70-80) did not follow the temperature. No desquamation; pruritus exceptional. Convalescence was slow. In three patients there was frank jaundice, in three slight, and in 8 none at all. The three jaundiced patients had eye symptoms and a specialist diagnosed iridocyclitis in two. Five patients had a relapse. The duration, apart from relapse, was 8-16 days. In the severe cases there was no rash.

Enteric fever was eliminated at the first outcrop, dengue was negatived by the absence of leucopenia, malaria by the absence of parasites. There was much in favour of leptospirosis, though the authors were unable to find spirochaetes in the blood or urine of two icteric patients or in guineapigs inoculated therewith or in the local rats, and they recall the Syra epidemic [this *Bulletin*, Vol. 29, p. 566, Vol. 30, pp. 15, 408]. Specimens of sera were sent to PETTIT in Paris and SCHUFFNER in Amsterdam; the results were not conclusive but these savants agreed that two of the severe cases gave a positive reaction for leptospirosis. Both laboratories reported in the negative for yellow fever. Lastly it is said that this affection resembles "red Congolese fever," which, however, is mild and of short duration. A. G. B.

FOURNIALS. *Traitement des diarrhées chroniques par la méthode de Montel.* [Treatment of Chronic Diarrhoea by Montel's Method.]—*Marseille-Méd.* 1933. Nov. 5. Vol. 70. No. 31. pp. 509-514.

Montel's method, briefly described in this *Bulletin* [Vol. 25, p. 626], consists in administration of antidiysenteric serum by mouth and rectum. The author treated five patients with persistent diarrhoea probably beginning with bacillary dysentery. They had been submitted to various treatments without benefit. He gave by mouth as much as 12 ampoules of serum a day. The class of diarrhoea which is benefited is that in which the stools are foetid and coloured, with or without blood and mucus. A. G. B.

VASSALLO (S. M.). *Tropical Neurasthenia: its Possible Relationship to Hyperthyroidism.*—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934. May 9. Vol. 27. No. 6. pp. 625-627.

The author with many years experience of the African tropics has seen several cases of Europeans with sleeplessness, irritability and frequent pulse, which he has believed to be due to thyroid hyperactivity and which have responded well to iodine treatment. Such patients have a high fasting blood sugar reading of about 0.18 per cent. and he suggests that a rise in blood-sugar is an early symptom of tropical neurasthenia. He notes that SEQUEIRA (1932) has put forward the hypothesis "that some cases of nervous irritability (in East Africa) may be related to excessive activity of the thyroid gland" and that glycogenic disturbances in hyperthyroidism are well known. He suggests that the iodine treatment may be worth further trial in these cases of irritability in the tropics which tend to pass on to tropical neurasthenia. A. G. B.

TALIAFERRO (William H.). *Some Cellular Bases for Immune Reactions in Parasitic Infections.*—*Jl. Parasitology.* 1934. Mar. Vol. 20. No. 3. pp. 149-161. [30 refs.]

CANNON and TALIAFERRO (1931) and Taliaferro (1932) (this *Bulletin*, Vol. 28, p. 494 and Vol. 30, p. 726) found that although malaria due to

Plasmodium cathemerium is a general infection, yet, practically, only the macrophages of the spleen, liver and bone marrow are involved in defence; this results from the circulation in these organs being sluggish, so that the parasitized red cells come into prolonged contact with the macrophages. In the case of *Leishmania donovani* infection, while the macrophages ingest the parasites they have not the power to digest them.

A different mechanism is at work in *Trypanosoma lewisi* infection of the rat, whereby fission of the trypanosomes is caused to cease. This inhibition is due to a specific antibody which is transferable passively to normal rats and which is diminished by splenectomy and India ink blockade. Trypanocidal antibodies which kill the trypanosomes by extracellular lysis or opsonization are also formed and have been shown by Toliaferro to be similarly diminished by these two procedures. That the spleen possesses peculiar properties in addition to its content of lymphatic and reticular cells, seems unlikely in view of the ease with which a large part of the loss sustained through splenectomy is made good by the body.

Passing to the consideration of immunity in helminth infections, the author considers the work of O'CONNOR and HULSE (1932) and O'CONNOR (1932) (*loc. cit.*, Vol. 29, pp. 765-6) on *Wuchereria bancrofti* filariasis, suggestive of the same cells being responsible for the defence in such worm infections as in protozoal infections MILLER and GARDINER (1932) (*tom cit.*, p. 748) have now produced the first clear evidence of transfer of *passive* immunity among helminths, in the case of the cysticercus of *Taenia taeniaeformis*.

Following the experimental demonstration by BLACKLOCK and THOMPSON (1923) of acquired immunity after infection by a metazoan parasite, *Cordylobia anthropophaga*, BLACKLOCK and GORDON (1927) studied the immunity reactions (*loc. cit.*, Vol. 21, p. 150 and Vol. 25, p. 252). Toliaferro discusses the results and is undoubtedly correct and well within the mark when he observes that the cellular basis of the immunity in helminth and other metazoan parasites has not been adequately studied. It is an advance, however, to have proved that immunity to such parasites exists and can be produced experimentally; possibly the actual mechanism will be elucidated in due time.

The author believes that where investigators have attempted to exclude antibodies they have generally meant serum antibodies and have given inadequate consideration to the local production of opsonins which may be effective only locally.

The reactions of normal and immune serum and drugs on the macrophage system are briefly discussed in the concluding section of this interesting and suggestive, if necessarily abbreviated, review of some of the more recent work on immunity in diseases due to protozoa and metazoa.

D. B. Blacklock.

PETER & GAETGENS. Ueber den serologischen Nachweis der Dassel-larveninfektion beim Rind und beim Menschen. [Serological Demonstration of Warble Infestation in Ox and Man.]—*Zent. f. Bakt. I. Abt. Orig.* 1934. July 2. Vol. 132. No. 1/2. pp. 81-90.

The losses which German agriculture suffers owing to the warble fly run into millions and make it easily understood why all affected districts have united in energetic measures of defence. It has long been recognized that young animals exposed to infection may be affected,

but with diminishing numbers of warbles in several successive years; the warbles cease to appear after about five years, even though the animals are still exposed to infection; seemingly a specific resistance has developed in such animals. The work of HADWEN and FULTON, HADWEN and BRUCE, ROUBAUD and PÉRARD, KOEGEL and of PETERS is mentioned and their finding of antibodies which give a precipitin reaction with protein substances present in the larvae, and also the anaphylactic effects produced by larval extracts when introduced intravenously, subcutaneously or by the conjunctiva. The authors in the experiments now recorded, treated rabbits by repeated subcutaneous injections of watery (physiological sodium chloride solution) extracts, and then tested their serum in complement-fixation and flocculation tests, using various larval antigens. For test antigens one part of very finely ground larval tissue was extracted with 5 parts of the extraction fluid, physiological salt solution or alcohol, for several months so as to obtain the greatest possible amount of active substance in solution. Details of the technique used and the results of several of the experiments are given.

The authors found specifically reacting antibodies present in the serum of the injected rabbits, in the serum of many naturally infected cattle, and also in the serum of a human case of infection with a larva which was apparently a warble larva.

D. B. Blacklock

FITZGERALD-MOORE (D. G.). **Retrobulbar Neuritis cum Avitaminosis.**—*West African Med J* 1934. Jan. Vol. 7. No. 3. pp 119-120. [Summary appears also in *Bulletin of Hygiene*.]

In this brief paper the author recurs to the condition previously described by him—a condition the study of which is not only of intense clinical and scientific interest, but is of wide public health importance in the tropics and perhaps elsewhere. After symptoms of glossitis and stomatitis and pruritus of the external genitalia there ensues a dimness of vision (in some patients this occurs at the same time as the other symptoms) with loss of central acuity, but not diminution of field of vision, a “partial post optic atrophy” which is not progressive.

School children are particularly affected, though the condition is not limited to them; a common factor in all appears to be prolonged “bad food conditions,” and in the author’s opinion, which is of much value as he has seen more than 300 cases in 4 years, probably the use of *garri*, a common and cheap food. This played a large part in the diet and in some patients almost to the exclusion of other foodstuffs. Whether the disease or symptom complex, is a pure avitaminosis or whether there is some undetermined toxin at work is a question for further study. The author draws attention once more to similar conditions described by SCOTT in Jamaica (this *Bulletin*, Vol. 13, p. 372) and WRIGHT in Sierra Leone (*Bulletin of Hygiene*, Vol. 4, p. 391) [See also MOORE, *Bulletin of Hygiene*, Vol. 8, p. 441.]

H. H. S.

BELL (P. S.). **The Treatment of Tropical Ulcers and Granulating Areas.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934. Mar. 12. Vol. 27. No. 5. pp. 511-516.

The author has extended the strapping method described by SAYERS after Dickson WRIGHT [this *Bulletin*, Vol. 30, p. 36] to the treatment of any granulating area.

It should in his opinion not be employed for tropical ulcers till the ulcer presents a non-sloughing granulating surface. To obtain such a surface application of powdered pot permang though very painful is by far the best of antiseptic dressings, but excision, curettage, and cauterization with pure carbolic is better still. The operation is followed by eusol dressings. A healthy surface is obtained in less than a week and then the adhesive plaster is applied only from a little below to a little above the ulcer, there is rarely any generalized oedema in the case of tropical ulcer so that the whole leg need not be covered. The dressing is left undisturbed on each occasion for 7-21 days. To facilitate removal he wraps the leg in a *single* layer of gauze, cutting a hole for the ulcer. The strapping can then be easily raised for removal by scissors. A table includes 19 cases; the average rate of healing was 0.21 sq. in. per diem and the time taken a little over 30 days (14 to 49). One of the ulcers was of two years' duration.

Granulating ulcers are skin grafted by Braun's method before strapping is applied. For the technique, largely DICKSON WRIGHT's, the paper must be read.

A. G. B.

SAYERS (Edward G.) **The Filarial Intradermal Skin Test in Tropical Myositis and Muscle Abscess.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934 Mar. 12. Vol. 27. No. 5. pp. 507-509.

Of eight cases of tropical myositis tested in the British Solomon Islands with Fairley's filarial intradermal test seven were negative.

BUXTON queried the filarial origin of tropical myositis as did the author [this *Bulletin*, Vol. 28, p. 46]. He therefore obtained a supply of *Dirofilaria immitis* antigen. The two first patients tested were one with microfilariæ and one with elephantiasis and no microfilariæ, both were positive, a large spreading wheal being produced. Only one of the myositis cases, which are described, gave the reaction; it has not been possible to examine this patient further. The author realizes that further work is needed but the results are to his mind strong evidence against the filarial origin of this affection.

A. G. B.

DAVID (J. Christodoss), RAJAMANIKAM (N.) & KRISHNASWAMY (R.). **Some Observations on the Cardiovascular Action of Urea-Stibamine**—*Indian J. Med. Res.* 1934. Jan. Vol. 21. No. 3. pp. 617-624. With 3 graphs.

These experiments were undertaken to extend the observations of CHOPRA (1927, see this *Bulletin*, Vol. 25, p. 412) who employed cats. The present authors used only dogs. They came to the following conclusions:—

"Urea-stibamine produces marked constriction of the volumes of the spleen, liver, kidney and intestines. There is a compensatory increase of the limb volume. The vasoconstriction is most marked in the liver and least in the lungs.

"Two hundred mg. to two hundred and fifty mg. of urea-stibamine given intravenously to anaesthetized dogs leads to a transient depression of the heart and dilatation, as observed by the myocardiograph. This effect appears in about 40 seconds and disappears in $1\frac{1}{2}$ minutes.

"On the blood-pressure the more constant effect is a preliminary fall succeeded by a rise above normal. This rise is not abolished by ergotoxin

and seems to be correlated with the marked constriction of the splanchnic blood vessels. The preliminary fall is perhaps due to the transient depression of the heart and diminished cardiac output. These results are obtained with doses that produce a concentration in the dog's blood of approximately 10 times that usually found in the human blood after therapeutic injections of about 200 mg. of urea-stibamine.

"Electrocardiograms taken after intravenous injections of 200 mg. of urea-stibamine to dogs and human beings show no abnormality.

"Therapeutic doses of about 200 mg. given intravenously to [10] human beings produce little effect on the blood-pressure.

"The classification of antimony among capillary poisons is questioned."

A. G. B.

CHOPRA (R. N.) & DE (Premankur). **A Preliminary Note on the Pharmacological Action of *Antiaris toxicaria*.**—*Indian J. Med. Res.* 1934. Jan. Vol. 21. No. 3. pp. 513-517. With 5 figs.

Antiaris toxicaria, the Upas tree, once reputed to destroy any living thing that approached it, is found in the Deccan peninsula as a large evergreen. The sap is used as an arrow poison in Burma and in Java, but its poisonous properties are not widely known in India and Ceylon.

The authors studied the chemical composition of the milky juice and its pharmacological action. The dried juice was found to have a slight stimulant action on the heart and circulation and in larger doses to act as a strong cardiac poison. The action was mainly on the myocardium and was stronger on the auricle than on the ventricle. The juice has perhaps some effect on the terminations of the vagi. There was no action on the higher centres. The drug produced a tonic contraction of the isolated as well as the intact intestines and uterus. The experimental animals were guinea-pigs, rabbits and cats.

[H. H. SCOTT (Byam's & Archibald's Practice of Medicine in the Tropics, Vol. 1, p. 769) states that the poison causes paralysis of the central nervous system.]

A. G. B.

VLEURINCK. Un cas d'empoisonnement par le lupapi. [**A Case of Poisoning by "Lupapi."**]—*Bull. Méd. du Katanga.* 1933. Vol. 10. No. 5. pp. 122-123, 125.

"Lupapi" is a Polygalaceous shrub, widespread in Tropical Africa, the Latin name of which is *Securidaca longipedunculata* Fresn. It contains methyl salicylate, or oil of wintergreen, in considerable quantity. In Katanga the native woman commits suicide by crushing or powdering the roots and stuffing them into the vagina. Death follows in 48 hours or later.

[The following extract from "The Medicinal and Poisonous Plants of Southern Africa" (WATT and BREYER-BRANDWIJK), Edinburgh, E. and S. Livingstone, is of interest:—

"We are informed that at Lealui a Rotse woman died after inserting the crushed roots [of *Securidaca longipedunculata*] into the vagina. . . . Our informant in this case distilled an oil from the root which, on analysis, was found to consist of 99.5 per cent. of methyl salicylate."

A. G. B.

POOKELS (W). Experimentelle Studien ueber die Wirkung des Retikuloendothels auf die Toxizitat und die Heilwirkung der Arsenobenzole. [Action of the Reticulo-Endothelial System on the Toxicity and Curative Action of Arsenobenzol.]—*Arb. a. d. Staatsinst. f. Exp. Ther. u. d. Georg Speyer-Hause zu Frankfurt a.M.* 1934. No. 29. pp 12-45. [71 refs.]

The course of an infection with *Trypanosoma prowazeki* in the white mouse was uninfluenced by splenectomy, ligature of the spleen, implantation of splenic tissue or blockade of the reticulo-endothelial system with India ink, whatever the interval between the operation and the inoculation. Relapsing fever produced by a Russian strain of spirochaete was also entirely uninfluenced by these procedures, as was the tolerance of the mouse for neosalvarsan and neosilver salvarsan. Removal of the spleen did, however, influence the curative action of neosalvarsan; fourteen days after interference with the reticulo-endothelial system the minimal curative dose was greater than normal, though 121 days after the operation the curative dose was again normal. Ligature of the spleen had a similar effect, but implantation of splenic tissue and blockade of the reticulo-endothelial system had no action on the curative dose of neosalvarsan. Similar results to those with neosalvarsan were obtained with neosilver salvarsan. Extirpation and ligature of the spleen also decreased the curative action of arsonic acid. It is concluded that the curative action of the arsenobenzoles is in some way related to the function of the reticulo-endothelial system.

G. M. Findlay.

STINNESBERG (Martha). Brief aus Ostafrika Die ersten sechs Jahre im kath. Missionshospital Ndanda, T.T.-Ost-Afrika [Six Years in a Mission Hospital, Tanganyika Territory.]—*Muench Med Woch.* 1934 Mar. 2. Vol. 81. No. 9. pp. 333-335

A general account of disease conditions seen at this Mission Hospital, inland from Lindi in Tanganyika Territory. More than half suffered from yaws, i.e., 19,031 in 6 years.

A. G. B.

ANTUNES (P. C. de Azevedo) & LANE (J.). Nota sobre a distribuição geografica dos culicídeos (Diptera) de São Paulo (Brasil).—Reprinted from *Rev. Biol. e Hig.*—1933 Dec. Vol. 4 No. 3. 7 pp [Issued as Boletim No 50 do Inst. de Higiene, São Paulo]

CAWSTON (F. G.). The Control of Respiratory Disease in the Tropics.—*Jl. Trop. Med. & Hyg.* 1933. Nov. 1. Vol. 36. No. 21 pp. 333-334

CAWSTON (F. G.). Some Effects of a Prolonged Drought on Disease-Carriers.—*Jl. Trop. Med. & Hyg.* 1934. July 2 Vol. 37. No. 13 pp 195-196

COURBOULÈS (P) & MANDILLON (G. A. L.). Accidents graves survenus après une piqûre d'hyménoptère.—*Arch. Méd. et Pharm. Milit.* 1934 Mar. Vol. 100. No. 3. pp. 297-303.

DUNNEWOLD (R). Een nieuwe anopheles-larve (*A. Leucosphyrus* var. *Hackeri*?).—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1934 Jan. 30. Vol. 74. No. 3. pp 170-173. With 1 fig. English summary.

FRÓES (Heitor P). Doenças ou afecções causadas por animais vulnerantes, tóxicos ou eletrizantes.—Reprinted from *Jl. dos Chímicos.* 1933. Mar. 15 & 31, & Apr. 15. Nos. 5, 6 & 7. 29 pp.

FRÓES (Heitor P.). Estudo experimental sobre o veneno dos Niquins (Thalassophryinae).—Reprinted from *Bahia Médica* 1933. Oct. No. 10. 9 pp With 1 fig.

- FRÓES (Heitor P) Contribuição ao estudo da ação vesicante dos potós (Coleopteros vesicantes)—Reprinted from *Jl dos Clinicos* 1934 Feb 28 No 4 22 pp With 4 figs [14 refs]
- FRÓES (Heitor P) Estudios sobre los peces toxiferos del Brasil Algunos experimentos con *Thalasso-phrymidae*—*Medicina Países Cálidos* Madrid 1934 Feb Vol. 7 No 2 pp 49-52 With 2 figs
- GERMAIN (Louis) Mollusques terrestres et fluviatiles de l'Afrique Occidentale Française [Mission À CHEVALIER, 1931-1932]—*Bull Comité d'Etudes Historiques et Scientifiques de l'Afrique Occidentale Française* 1933 Apr-June Vol 16 No 2. pp 169-236 With 8 figs [Refs in footnotes]
- GOVI (Luis) Aspecto social e importancia económica—*Semana Méd* 1934 Apr 19 Vol 41 No 16 (2101). pp. 1201-1210
- GRASSET (E.) Etudes comparées sur l'immunité antitoxique chez les reptiles—Reprinted from *Deuxième Congrès Internat de Path Comp* 3 pp.
- GRIMALDI (Valentino) Gli ixodidi delle Colonie Italiane e le malattie da essi trasmesse—*Arch Ital Sci Med Colon* 1934 July 1 Vol 15. No 7. pp 504-513 [10 refs] English summary (2 lines)
- IMPASTATO (Aldo) Di alcune affezioni chirurgiche riferentisi alla patologia coloniale—*Arch. Ital Sci Med Colon*. 1934 Apr. 1 Vol. 15 No 4 pp 266-284 With 6 figs English summary (3 lines)
- KAMPMEIER (R H) & HINMAN (E H) Mite Infestation in the Human Intestine—*Southern Med Jl* 1934 Mar Vol 27 No 3 pp 271-274 With 1 fig
- LARSEN (Albert E) Some Medical Observations in the Pacific Islands and Dutch East Indies—*California & Western Med.* 1934 June Vol 40 No. 6. pp. 413-417. With 5 figs
- MASSIAS (C) La fièvre typhoïde en Cochinchine Etude de 89 cas à l'hôpital de Sotrang—*Bull Soc Path Exot.* 1934 May 9 Vol. 27. No. 5. pp 406-413 With 1 chart [11 refs]
- DE MELLO (I. Froilano). Le Service de Santé à l'Inde Portugaise (1929)—*Arquivos da Escola Méd.-Cirurg de Nova Goa*. Ser B 1933 No. 4. pp 784-829 [Main Report in French pp 784-816, Appendix in Portuguese headed "Pontos de hygiene e epidemiologia peculiares a algumas delegacias. (Notas tomadas aos relatórios anuais dos Delegados e Sub-delegados de saude) pp. 817-829.]
- MILLOUS Note sur le rhumatisme aigu et les particularités des arthrites aiguës sous les tropiques—*Ann de Méd et de Pharm Colon.* 1934 Jan-Feb-Mar Vol 32. No. 1. pp. 70-78
- O'FLYNN (J. A) & RUDD (E T. S). A Case of Rhinosporidiosis—*Jl Roy Nav Med Serv* 1934 July Vol. 20. No 3. pp. 258-260 With 2 figs
- PANAGIA (Antonino). I protozoi parassiti intestinali dell'uomo in 500 esami consecutivi di feci, eseguiti nell'Istituto di Parassitologia Medica di Roma—*Polichinico*. Sez. Prat 1934 Mar. 12. Vol 41 No 10. pp. 368-371
- PARROT (L). Notes sur les phlébotomes. VII—Sur la présence de *Phlebotomus sergenti* dans le Tassili des Ajers (Djanet, Sahara central).—*Arch Inst. Pasteur d'Algérie*. 1934. Mar. Vol. 12 No 1. pp. 77-78
- PARROT (L.). Notes sur les phlébotomes. VIII.—Présence de *Phlebotomus perniciosus* var *tobbi* Adler et Theodor, 1930 en Georgie (U.R.S.S.).—*Arch Inst. Pasteur d'Algérie*. 1934. Mar Vol. 12. No. 1 pp 79-82. With 2 figs.
- PENSO (Giuseppe). Il "latah" nella Somalia Italiana.—*Arch Ital Sci. Med. Colon*. 1934. May 1. Vol. 15. No 5. pp. 364-367. With 1 fig English summary (4 lines).
- RICCI (Emanuele). Nosografia delle oasi di Cufra (Cirenaica) (Nota preliminare).—*Arch Ital Sci. Med. Colon*. 1934. June 1 Vol. 15. No. 6. pp 451-463. With 4 figs. English summary (3 lines).
- ROBINSON (W) & SIMMONS (S. W.). Surgical Maggots in the Treatment of Infected Wounds: Recent Apparatus and Methods in Maggot Production and Research.—*Jl. Lab & Clin. Med.* 1934. Jan. Vol. 19. No. 4. pp. 339-343. With 2 figs.

- SINTON (J. A.) Notes on Some Indian Species of the Genus *Phlebotomus* Part XXXVI Diagnostic Table for the Males of the Species Recorded from India—*Indian Jl Med Res* 1933 Oct Vol 21 No 2 pp 417-428 With 75 figs on 4 plates [67 refs]
- SMITH (E. C.) Postmortem Report on a Case of Sickie-Cell Anaemia—*Trans Roy Soc Trop Med & Hyg* 1934 Aug 4 Vol 28 No 2 pp 209-214 With 4 figs on 1 plate [11 refs]
- SOLTERO (A. Garcia) Fiebre por la mordedura de la rata—*Bol Asoc Med. de Puerto Rico* 1933 Oct Vol 25 No 10 pp 557-560
- STRONG (W. M.) The Health of the People of Papua [Correspondence]—*Med Jl Australia* 1934 Jan 20. 21st Year Vol 1 No. 3 pp. 107-108
- THEODOR (Oskar) Some African Sandflies—*Bull Entom Res* 1933 Dec. Vol 24 Pt 4 pp 537-547. With 5 figs. & 2 plates [18 refs]
- WOLTER (A.) Die Daktylitis bzw. Phalangitis bei Syphilis, Tuberkulose, den "Sarkoiden im weiteren Sinne" nach Darier (Lupus Pernio und Sarkoid Boeck), Framboesie und Lepra. Eine röntgenologische und histologische Betrachtung—*Klin Woch* 1934. June 2 & 9 Vol 13 Nos. 22 & 23. pp 811-816; 846-852 With 12 figs [54 refs]
- ZAVATTARI (Edoardo) L'ainhum nel Fezzan—Reprinted from *Arch. Ital. di Dermat* 1934 Vol 10 No 3 pp. 343-344. With 1 fig
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REVIEWS AND NOTICES

WIGGLESWORTH (V. B.) [M.A., M.D., Lecturer and Milner Research Fellow in Medical Entomology, London School of Hygiene & Tropical Medicine]. *Insect Physiology*.—pp. x+134 With 13 figs. Monographs on Biological Subjects 1934. London Methuen & Co. Ltd., 36 Essex Street, W.C. [3s. 6d.]

The author presents a compact account of the physiology of insects. It is noticed here because of its importance to the applied entomologist and to those who enquire into the epidemiology of insect-borne diseases.

The reviewer was aware that much work has been published on insect physiology (indeed the author appears to have read about 2,000 papers relating to the subject) · he was therefore most interested to discover whether it had been possible to write a connected account of it, for it is difficult to say at what point one should start. Wigglesworth's arrangement is original and successful. For him the insect is a small terrestrial animal with a hard covering which can resist loss of water. He therefore deals first with the cuticle of insects, describing its structure and chemistry. The rigid properties of the cuticle determine moulting and the peculiar growth by sharply defined stages. Moreover, as respiration throughout the general surface of the insect is greatly hindered by the cuticle, a more specialized system must be developed. But the tracheal system of respiration, depending largely as it does on the process of diffusion, can only be effective up to a certain limit of size, so that the insects have always been small. But as they are small, with a large area of surface for each unit of volume, the danger of fatal loss of water is the greater. They must therefore economize water in their processes of excretion, digestion and respiration.

To readers of this *Bulletin*, certain parts of the book possess technical interest ; for it is the physiologist alone who can explain why it is that particular insects are limited by climatic factors or are more abundant at one season than another. The author considers also the surface forces which exclude water but permit the entry of oil into the respiratory system of mosquito larvae. Parts of the book therefore relate immediately to applied entomology, but beyond that it will greatly improve our understanding of the life of insects. This is of great practical importance, for nearly all the problems which face the applied entomologist are physiological : he wants to know whether the yellow-fever mosquito could establish itself in this country, or why it is that the resistance of insects to fumigants is so complex, or why the females choose a particular place for oviposition. Such topics as these are discussed, and to some extent explained, in the book which is before us. The author has certainly succeeded in presenting the subject in a unified way.

P. A. Buxton.

CALCUTTA. **Annual Report of the Calcutta School of Tropical Medicine and the Carmichael Hospital for Tropical Diseases 1933** [ACTON (H. W.), Director].—174 pp. With 8 plates & 1 chart. 1934. Alipore : Bengal Govt. Press.

This report of the Director of the School and Superintendent of the Hospital also contains more detailed reports of professors at the school and of the routine and research departments. Many of these

reports are themselves scientific contributions, even in their official form, and present the results of research work which has either been published or will be published. Some of these may be briefly noticed —

In the short period of two months 704 strains of vibrios were isolated from 470 clinical cases of cholera. Analysis showed that "the rough strains of vibrio were found generally after the fifth day of disease and the frequency of rough strains was most marked towards the end of the epidemic." Both agglutinability and lysability of vibrios received special attention. "None of the non-agglutinating vibrios were lysable by cholera phage type A," but many of them underwent lysis by a mixed cholera phage. These variations in character of the isolated vibrios are of the greatest interest for the much disputed questions of transformation or transmutation of cholera vibrios, and above all because the strains are taken direct for examination from the clinical case of cholera. Variation in character has been studied not only from case to case but also in the same case. Thus, for example it was found that whereas in the first two days of the disease agglutinating vibrios were isolated "from 82 per cent of the cases examined, from the third day of the disease onwards the frequency with which agglutinating vibrios can be isolated decreases." Again the relative proportions of non-agglutinating to agglutinating vibrios were at the beginning, the height and the decline of the epidemic as 1 to 5, 1 to 7 and 1 to 1.5 respectively. A very good suggestion is made for the application of the alternate case method to current hospital cases and is worth noting for adoption elsewhere, where accommodation is available. It was to set apart two wards and admit alternately to each ward, "the treatment in the two wards to be identical except that in one ward bacteriophage would be used in addition." The results of this trial applied to 290 cases treated with cholera phage and 180 without were 42 (14.5 per cent) deaths and 40 deaths (22.2 per cent) respectively.

A new malaria parasite of the monkey (*Silenus irus*) has been found and is named *Plasmodium knowlesi*. This parasite, used in the monkey, has furnished valuable results for the scientific therapy of malaria. Many attempts have been made to transmit malaria from man to the monkey but all have failed in the lower apes, "whereas monkey malaria of the lower apes (*P. knowlesi*) can be readily transmitted to man."

A research in connexion with the treatment of chronic intestinal amoebiasis promises good results and the criterion of cure was the negative character of the six stools after the completion of treatment. The remedy tried was "carbarsone" in 73 cases admitted to hospital. Sixty of these were discharged as "cured" after a 10-day course of treatment. Carbarsone is harmless, easy to take and non-toxic.

An interesting case of rat-bite fever, or rather the causative organism *Spirillum minus*, was found in the nasal mucosa of a leper. Its presence there is traced to a probable bite of a rat through an anaesthetic area of which the leper remained unaware.

Research work has continued on a large number of indigenous drugs. One of these researches was rather out of the ordinary run of such investigations. It was an endeavour to help the Indian Tea Association "to prepare a good beverage from an infusion of tea. . . . A really fine beverage was finally produced," a beverage with the

character of a cider. It was tested and approved of by an informal committee at the Bengal Club. Another interesting study led to the finding that the country beers of India "have a low alcoholic content and a high nutritive value, being rich in vitamins. In areas where these beers are drunk, there is marked absence of vitamin deficiency diseases."

Many other points of interest might be extracted from the several reports presented in this annual publication. The subjects which are treated from a research point of view are called "enquiries" and these are: Kala azar, leprosy, skin diseases, malaria transmission, indigenous drugs, drug addiction, blood changes in tropical diseases, hookworm, filariasis, malaria, standardization of Indian foodstuffs, and respiratory diseases. The mere enumeration of the subjects of investigation shows the range of research activity, while the researches themselves are on a scale which is not easily available in many other parts of the world. It is pleasing to read of the direct and indirect financial support accorded to the School by the Bengal Government, the Indian Research Fund Association, important commercial industries, and of the printing house which is so closely associated with the publication of its important memoirs. One may hope that this weighty support may continue unabated for the weighty subjects dealt with. They represent the good dividends paid on the capital invested.

W. F. Harvey.

BOSE (J. P.). [M.B. (Cal.), F.C.S. (Lond.), etc.] **A Handbook on Diabetes Mellitus and its Modern Treatment.** Second Edition. Thoroughly Revised, Partly Rewritten and Brought Up to Date with Two New Chapters.—pp. xviii+232. With 5 charts, 6 figs. & 1 coloured plate. 1934. Calcutta. Thacker, Spink & Co. [Rs. 6/8.]

This is a new edition of a book reviewed favourably in this *Bulletin* as recently as 1929 [Vol. 26, p. 426]. It has, the author tells us, been thoroughly revised and includes two entirely new chapters and two appendices. The parts dealing with carbohydrate metabolism, pathology and treatment have been rewritten. His object is to destroy the fatalistic attitude to diabetes which, he says, is far too prevalent in India. This edition has the advantage of a preface from Sir John MEGAW who anticipates a large demand. Clearly the book has met a need.

A. G. B.

TROPICAL DISEASES BULLETIN.

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1934.

[No 12.

YELLOW FEVER

BEEUWKES (Henry) & MAHAFFY (A. F.). **The Past Incidence and Distribution of Yellow Fever in West Africa as indicated by Protection Test Surveys.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934. June 30. Vol. 28. No. 1. pp. 39–76. With 6 maps & 1 graph. [12 refs.]

This most interesting article summarizes the results of a yellow fever protection test survey comprising the examination of 7,580 sera collected in 181 towns in eight colonies of West Africa, *viz*, Nigeria, Gold Coast, Sierra Leone, Gambia, Liberia, Dahomey, Niger and the (French) Sudan

These results confirm and very greatly extend those previously recorded by Beeuwkes, BAUER & Mahaffy [see this *Bulletin*, Vol. 28, p. 283], but in this earlier work monkeys were used as the test animals and consequently only a very limited number of tests could be made. As a result of the introduction of the mouse protection test an almost unlimited extension of the work has become possible.

The usual number of specimens of serum collected in a centre was 25 from children and 25 from adults. The blood was collected in 30 cc vacuum tubes which were completely filled and whenever possible preserved in refrigerators until tested. Six young mice of a susceptible strain were used for testing each specimen; when all or five mice survived the specimen was considered as positive, when four or more died, as negative, otherwise as inconclusive. The results of these tests are given first in tabular form and then discussed in detail under the ~~heads~~ of the various colonies. The findings again suggest that yellow fever is far more prevalent in West Africa than was previously supposed, for large numbers of positive sera were found both in the coastal regions and in the interior, and approximately 25 per cent. of all specimens examined gave positive results. Practically the whole area covered by the survey was found to be infectible and few towns seem to have escaped the disease during the present generation. Positive sera were obtained from natives even on the Jos Plateau at an elevation of more than 4,000 feet.

In Nigeria the most striking finding is the demonstration of the heavy past incidence of yellow fever compared with the reported cases. During the past 25 years it has been recorded in only 22 places, and most of these were isolated cases among Europeans. In the past 10 years a total of 53 cases have been observed in only 10 towns, and throughout

the whole of Northern Nigeria above 10° latitude only 3 cases of yellow fever have ever been reported. Nevertheless, the results of protection tests suggest that few towns of any size have escaped, and that large numbers of even the smallest villages have been visited by the disease within recent years. Specimens of sera from children under 15 years of age living in 99 towns and villages were examined and only 20 per cent of these localities were negative. When adults were included only four towns were completely negative. Even in sparsely inhabited areas a large number of specimens were positive, and it is known that epidemics occur in the semi-arid region north of Nigeria. The Sahara desert, however, forms an effective barrier against the infection.

It is evident that yellow fever is rarely recognized in the native, for in a large proportion of the positive localities, with percentages reaching as high as 92 per cent. positive, the disease had never been recorded. On the contrary, the examination of specimens of blood from Europeans who had lived in West African colonies for 10 to 40 years did not reveal any positive sera. It is evident that mild unrecognized cases of the disease, so common in the native, are relatively infrequent in Europeans living in West Africa.

The results of the protection test survey by colonies are summarized in the following table.—

Colony	Number of towns where specimens were collected	Total number of specimens	Number positive	Per cent positive	Remarks
Nigeria	120	5,607	1,508	27	Includes specimens collected in numerous small villages. Collection at Georgetown included donors from many small villages in the vicinity. Collections at the Firestone Plantation were from donors coming from many towns* in the interior.
Gold Coast	33	861	168	20	
Sierra Leone	5	149	19	13	
Gambia ...	2	68	18	26	
Liberia ..	3	96	6	6	
Dahomey	5	188	56	30	
Niger ...	11	481	104	22	
Sudan ...	2	130	Nil	Nil	
Total ...	181	7,580	1,879	25	

The findings confirm the opinion that an endemic area of yellow fever exists in South-Western Nigeria, which may extend westward into neighbouring colonies. The meteorological conditions in Northern Nigeria, however, seem to be unfavourable for the permanent existence of the disease. Age-group studies in large towns of endemic areas show that the disease is not confined to children but that the percentage of

immunes gradually increases up to old age, and some persons escape throughout life. It is also shown that extensive epidemics have occurred in endemic areas

The great value of piped water supplies and effective sanitary services, in reducing or eliminating yellow fever infection, is brought out in many of the places studied and especially in Freetown, Sierra Leone, and in some of the coastal towns of the Gold Coast and Nigeria.

[In the space at our disposal it is only possible to give a brief outline of the contents of this valuable report which should be read in its entirety by all those interested in yellow fever, or in general epidemiology.]

E. Hindle.

BOYÉ. Les recherches concernant le test de protection contre la fièvre jaune en Afrique Equatoriale Française et au Cameroun. [**The Protection Test against Yellow Fever in French Equatorial Africa and the Cameroons.**]—*Bull. Office Internat. d'Hyg. Publique*. 1934. June. Vol. 26 No. 6. pp. 1061-1066.

A total of 1,008 samples of blood were collected by BURKE and DURAND from various parts of French Equatorial Africa and the Cameroons, and tested for yellow fever immunity by means of the mouse protection test. The results are given in tabular form and show that out of 32 localities in Equatorial Africa only 5 were negative, the remaining 27 showing percentages of positive sera ranging from a maximum of 95.5 per cent. down to a minimum of 4 per cent., with an average of 42.63 per cent.

These figures are very difficult to understand for they are much higher than the averages obtained in the epidemic centres of French West Africa where there have been great epidemics in the past and annual recurrences of the disease. In Equatorial Africa, Libreville has been occupied for 80 years and yet in spite of an index of 20 per cent. positive, there has never been a clinically diagnosed case of yellow fever in any European. The author calls attention to similar results in other localities, including the positive results recorded in the Bahr-el-Ghazal and Uganda; and points out that these discrepancies could be explained if the mouse protection test was not strictly specific. Consequently it is of the highest importance to know if the presence of sero-protection is a certain indication of previous infection with yellow fever either apparent or non-apparent.

E. H.

MOUCHET (R.), VAN HOOFF (L.), DUREN (A.), FONTANA (L.), CLAREBOUT (G.), HENRY (E.), & HENRARD (C.). Résumé de l'enquête sur l'endémicité amarile au Congo Belge en 1932-1933. [**Summary of an Inquiry into the Endemicity of Yellow Fever in the Belgian Congo during 1932 and 1933.**]—*Bull. Office Internat. d'Hyg. Publique*. 1934. June. Vol. 26. No. 6. pp. 1067-1071.

Details of this inquiry will be published elsewhere, but the results of mouse protection tests with sera collected from various parts of the Belgian Congo show similar points to those recorded by BOYÉ [see above], and in particular a high percentage of positive sera in regions where no suspected case of yellow fever has ever been recorded. The epidemic at Matadi seems to be extinct, for whilst the adult natives gave an incidence of 41 per cent. positive, the children showed only 6 per cent. positive. It is curious, however, that regions in the interior

of the Congo where the disease has never been diagnosed clinically, give a higher percentage of positive sera than the coastal regions.

E. H.

JORGE (Ricardo). Sur la prospection biodémique de la fièvre jaune. [The Biological Survey of Yellow Fever Endemicity.]—*Bull. Office Internat. d'Hyg. Publique* 1934. Aug. Vol 26 No. 8 pp. 1396-1402.

The results furnished by Dr. BEEUWKES of the examination of 950 sera for yellow fever immunity from 19 localities in Angola, by means of the mouse protection test, show that no less than 44 were definitely positive and 36 doubtful, out of 75 from San Thomé Island 4 were positive.

In an interesting discussion of these results the author points out that no cases of yellow fever have been recorded from Angola since the epidemic of 1860 to 1870, and never from San Thomé. Attention is called to similar puzzling results of these tests in other parts of Africa, to which BOYÉ has drawn attention [see above]. It is aptly pointed out that no biological test of this nature is infallible, and the possibility of antibodies being developed in the absence of the specific infections is well shown in the case of placental blood which contains antibodies against measles, diphtheria, poliomyelitis, and scarlet fever. These incertitudes indicate that one should hesitate before accepting the view that yellow fever may exist in two forms, one producing typical clinical symptoms and the other no changes except the development of protective antibodies. The author prefers to adhere to the experience of more than 30 years which shows that by the application of ordinary prophylactic measures against yellow fever—by which is meant actual clinically recognizable cases of the disease—successive epidemics have been brought under control, and he refuses to have any exaggerated fears of the "vague phantom" created from the results of serum protection tests.

E. H.

JAMES (S. P.). Renseignements sur la fièvre jaune reçus pendant les six mois se terminant au 31 mars 1934. [Information on Yellow Fever received during the Six Months ending 31st March, 1934.]—*Bull. Office Internat. d'Hyg. Publique*. 1934 June. Vol 26 No. 6. pp. 1048-1056. With 1 folding map.

The results of applying the mouse protection test for the examination of the sera of natives of the Anglo-Egyptian Sudan are shown in the following table, which includes figures obtained up to the end of December, 1933.

Province.	Locality.	No. of sera tested.	No of positive results.
Blue Nile	Khartoum	36	1
"	Wadi Medani	3	0
White Nile	Kosti	26	4
Upper Nile	Malakal	50	1
Mongalla	Juba	55	6
Bahr-el-Ghazal	Wau	27	7
" "	Rumbek	30	17

The four positive results from Kosti and the one from Khartoum were obtained with the sera of non-residents of these localities.

These very important results are discussed by Dr. W. A. SAWYER in a letter to the author. The existence of such a high proportion of sera giving protection against yellow fever virus is considered to be a clear proof that they have been infected, but gives no information as to what proportion of the immune population may have shown any characteristic clinical symptoms, since during an epidemic the number of persons immunized is always much higher than the number of cases diagnosed clinically. It is very difficult to explain these "silent zones" of yellow fever in which an appreciable proportion of the population shows immunity, although no cases of clinical yellow fever have yet been observed. Possibly there are different strains, for a Brazilian strain, F. W., studied both in Brazil and New York, generally produces only fever in monkeys, without any other obvious symptoms. Yet in two cases this strain has produced typical fatal yellow fever with the same lesions as the most virulent strains.

Dr. G. M. FINDLAY also summarizes reasons for considering the mouse protection tests as specific for yellow fever.

Dr. G. B. SYMES gives particulars of the examination for mosquitoes of 30 aeroplanes at Kisumu and Nairobi, between June and December, 1933. In 18 aeroplanes *Anopheles* were found, and in 12, *Culex*; also tabanids were frequently present. The insects were found in the passenger's cabin or the small compartment between this and the pilot's cabin.

In addition the article contains summaries of other observations on yellow fever which are summarized under the names of their respective authors.

E. H.

HEWER (T. F.). **Yellow Fever in the Anglo-Egyptian Sudan. Sero-logical and Post-Mortem Evidence.**—*Lancet*. 1934. Sept. 1. pp. 496-499. With 1 map.

During the last two years sera have been collected from representative groups of adults and children in the southern and western provinces of the Sudan and in the central district of Khartoum. These have been examined at the yellow fever laboratories of the Rockefeller Foundation at New York, by means of the mouse protection test and the results are of very great interest, for a wide zone has been discovered in which the disease appears to be, or to have been, endemic.

At Wau, 7 out of 27, and at Rumbek, 17 out of 30, adults, had positive sera. At Juba, out of 28 adults 3 were positive, and 3 gave partial protection, and 3 out of 22 children were also positive. At Malakal, another Imperial Airways port, among 55 persons one was positive and 3 inconclusive. Summarizing the results it would seem that yellow fever was present probably in endemic form in the Bahr-el-Ghazal six years ago; in Mongalla seven years ago; in the Upper Nile Province between eleven and eighteen years ago, and in the Nuba mountains thirty years ago. There is no evidence of the disease ever having been present in the North of the Sudan, all sera from Khartoum and El Obeid being negative. In addition a fatal case of the disease with typical clinical symptoms occurred in a native of Wau during June 1934, and the diagnosis was confirmed by histological examination of the liver which showed advanced necrotic changes and Councilman lesions.

An interesting corroboration of the previous existence of yellow fever in Darfur is furnished in a recent article by Prince Omar Toussou, who mentions that during the Mexican War in 1863, 453 Sudanese soldiers from Darfur and Kordofan were sent to Vera Cruz where the mortality from yellow fever among Europeans was very high. African troops were in great demand because they were known to be immune to yellow fever and of these Sudanese only one, their commanding officer, died of the disease.

The difficulty of diagnosing mild or even fatal attacks of yellow fever is well known, and in a discussion of the apparent absence of any case of the disease among the foreign residents the author points out that in an area of 293,000 square miles, there are only about 700 persons who are at risk and in whose case a clinical diagnosis can be made. The possible danger of the spread of the disease by air and measures adopted for preventing it are described in detail and follow the general lines laid down in the International Convention for Aerial Navigation, to which the Sudan Government has become a signatory. *E H.*

BOYÉ. Répartition des cas de fièvre jaune signalés en Afrique Occidentale au cours de l'année 1933 [**Distribution of Cases of Yellow Fever reported from West Africa during 1933.**].—*Bull. Office Internat. d'Hyg. Publique* 1934. June. Vol. 26. No. 6. pp. 1045-1047 With 1 map.

During 1933, in addition to the epidemic in the Bissagos Islands, cases have been recorded from the following provinces: Senegal, Niger Colony, French Guinea, Ivory Coast, Togoland, Gold Coast and Nigeria. These occurred in Europeans, 29 cases with 27 deaths; natives, 13 cases with 9 deaths; and Syrians, 7 cases with 6 deaths. The wide distribution of these cases is noteworthy and clearly indicates the necessity of continued sanitary supervision to prevent the development of epidemics. *E H.*

SOPER (Fred L.). **Some Notes on the Epidemiology of Yellow Fever in Brasil.**—Reprinted from *Rev. Hyg e Saude Publica* 1934. Feb. & Mar. Vol. 8 Nos. 2 & 3. pp. 37-61; 73-94 With 21 maps (1 folding), 1 chart & 3 figs.

These interesting notes on the epidemiology of yellow fever in Brazil are based on the observations of the Co-operative Yellow Fever Service maintained by the National Department of Health of Brazil and the Rockefeller Foundation.

Details are given of the epidemic at Cambuci, a small town of 823 inhabitants in the State of Rio de Janeiro, which has been carefully studied since the outbreak of yellow fever in 1928. The results of laboratory tests of 555 samples of sera show that approximately 60 per cent. of the population were immune, but the number of clinically recognized cases of the disease was only 13, with 5 deaths, between November 1930 and February 1931. It seems evident that the disease was widespread in a mild form, and the examination of the sera of persons "with a history of recent illness" compared with those without such a history supports this view, for a high degree of association was found between positive history of recent illness and positive protection test result (89.5 per cent, as compared with 46.8 per cent. in those without history of recent illness).

The symptoms among individuals who reported recent illness at this time are collected in the following table.—

Distribution of declared symptoms and signs among individuals reporting recent illness by age-groups

Age group	Census	History of illness Oct., 1930, Mar., 1931	Percentage of group with history of illness	Fever.	Headache	Body Pains	In Bed	Nausea.	Vomiting	Icterus	Epigastric pain	Conjunctival Congestion	Ulorrhagia
0-4	89	17	19.1±2.8	17	16	15	15	11	13	2	1	0	0
5-9	105	33	31.4±3.1	32	29	27	28	13	14	3	4	0	1
10-14	94	26	27.7±3.1	25	25	23	24	8	8	1	2	0	0
15-19	121	41	33.9±2.9	40	40	40	34	11	11	4	3	2	0
20-29	157	49	31.2±2.5	48	49	48	48	20	18	6	5	2	0
30-39	98	25	25.5±3.0	25	24	23	20	11	8	0	2	1	0
40-49	79	20	25.3±3.3	20	20	20	17	10	8	6	4	0	1
50-59	45	11	24.4±4.3	11	11	11	11	2	3	0	0	0	0
60-69	17	4	23.5±6.9	4	4	4	4	1	0	0	0	0	0
+70	18	1	5.6±3.7	1	1	1	1	0	0	0	0	0	0
Total	823	227	27.6±1.0	223	219	212	202	87	83	22	21	5	2
Percentage of persons ill reporting a given symptom				98.2	96.5	93.4	89.0	38.3	36.6	9.7	9.3	2.2	0.9

Additional notes are given on the rural epidemic of yellow fever, without *Aedes aegypti*, in the Valle do Chanaan, Espirito Santo, Brazil, in 1932, and also on the value of the viscerotome for the removal of liver tissue from fatal cases for the discovery of silent yellow fever foci [*ante*, p 77 and below].

In conclusion the author discusses the organization of the Yellow Fever Service in Brazil and calls attention to the urgent necessity of the disease being considered as a continental problem in South America, in view of the widespread distribution of the mosquito and the increased means of rapid transportation. This continental program of work should comprise:—

“(1) Anti-larval services in all principal cities and in all ports in Tropical America. This measure should prevent the future widespread dissemination of virus, and should greatly reduce the possibility of its international spread.

“(2) Protection test surveys to outline the recent distribution of yellow fever. This will undoubtedly be found much greater than is now believed.

“(3) Routine collection and examination of liver specimens from rapidly fatal febrile cases from all parts of possibly endemic areas. Smaller towns and rural areas are especially important.

“(4) Careful study of all places shown to be infected by the examination of liver tissue, with special reference to the possibility of vectors other than *Aedes aegypti* and of vertebrate hosts other than man.

“(5) Anti-larval services in all towns and villages in and about known infected areas.”

E. H.

SOPER (Fred L.), RICKARD (E. R.) & CRAWFORD (P. J.) **The Routine Post-Mortem Removal of Liver Tissue from Rapidly Fatal Fever Cases for the Discovery of Silent Yellow Fever Foci.**—*Amer. J. Hyg.* 1934. May. Vol 19. No 3. pp 549-566. With 3 figs & 2 maps. [12 refs.]

The desirability of obtaining samples of liver from rapidly fatal febrile cases in areas liable to infection with yellow fever has led the authors to devise an instrument—the viscerotome—which can be used by laymen without autopsy for the rapid removal of liver tissue. The construction of this instrument is shown in the accompanying figures and its use has made possible the collection of liver specimens by non-medical personnel, over a wide area, with a minimum of expense and trouble. General regulations for its use in Brazil were included in a Presidential Decree of May 23, 1932, and the results of examinations are of very great interest. Between May, 1930 and June 1933, 28,468 tissues were examined with 75 positive diagnoses of yellow fever, of which only 21 had been diagnosed clinically as suspected cases of the disease. With the exception of one case from Bolivia all these came from various parts of Brazil, mainly from its north-east corner. Typical fatal cases of the disease were found in otherwise silent endemic foci,

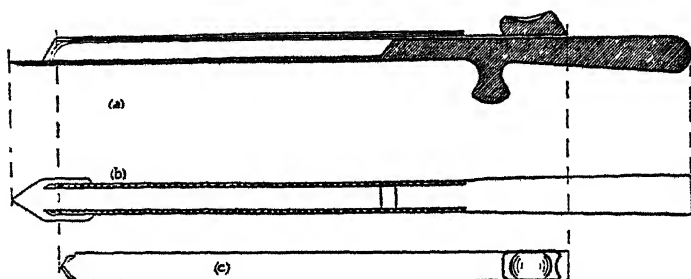


Fig 1 (a) Sectional view of viscerotome with sliding blade in cutting position. (b) Plane view of viscerotome with sliding blade withdrawn (c) Sliding blade

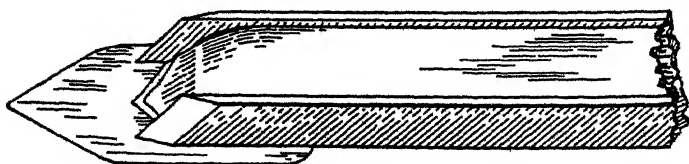


Fig 2 Distal portion of viscerotome showing position of sliding blade during introduction and withdrawal from the body.

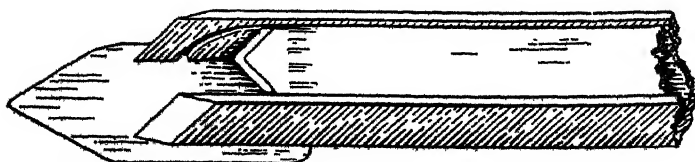


Fig. 3. Distal portion of viscerotome showing position of sliding blade during cutting of liver tissue

[Reproduced from the *American Journal of Hygiene*]

and in one village, the presence of yellow fever without *Aëdes*, was confirmed 11 months after the occurrence of the first suspect case. The results, however, in general confirm the absence of yellow fever virus from key-centres of population and also from hundreds of towns and villages in which anti-mosquito measures are being applied. In addition valuable data have been accumulated regarding the distribution of other diseases producing characteristic liver lesions. *E. H.*

SAWYER (W. A.). L'enquête sur l'immunité vis-à-vis de la fièvre jaune, au moyen de l'épreuve de protection de la souris. [**The Study of Immunity against Yellow Fever by Means of the Mouse Protection Test.**—*Bull. Office Internat. d'Hyg. Publique* 1934. June. Vol. 26. No 6 pp 1057-1060. With 1 folding map.

A brief summary of the work undertaken by the International Health Division of the Rockefeller Foundation on the distribution of yellow fever, by the examination of specimens of sera collected from various localities, and tested in New York, Lagos or Bahia, generally by means of the mouse protection test.

Approximately 25,000 sera have been examined up to date, and the only modification of the original method of using the test [see this *Bulletin*, Vol. 29, p. 198] has been to increase the strength of the infected mouse brain suspension from 10 to 20 per cent. The results of the examination of several hundred sera from non-endemic areas shows that less than 1 per cent. have given a positive reaction, these cases, doubtless being due to various causes of error. The specificity of the test is clearly indicated by the great number of positive results obtained in many endemic areas. The results support the view that yellow fever immunity is confined to two great regions, one in South America and the other in Africa ranging through West and Central Africa to the western frontier of the Anglo-Egyptian Sudan. All recent epidemics have occurred in these areas, but the regions in which immunity is found are very much more extensive than one would have expected from previous knowledge of the disease. *E. H.*

SAWYER (W. A.). Notre expérience de la vaccination contre la fièvre jaune [**Our Experience with Vaccination against Yellow Fever.**—*Bull. Office Internat d'Hyg. Publique*. 1934. June. Vol. 26. No. 6. pp. 1072-1074.

A total of 56 cases have been vaccinated in the laboratories of the Rockefeller Foundation by the use of human immune serum and neurotropic mouse virus, following the method recommended by Sawyer, KITCHEN & LLOYD [see this *Bulletin*, Vol. 29, p. 572]. The results indicate that this method is very efficacious and the sera of 35 persons tested before and after vaccination showed in every case the development of protective properties.

The sera of 11 persons collected 2 years after vaccination showed a slight diminution in the titre, and possibly it may be necessary to examine persons exposed to infection after an interval of 3 years and when the titre is very low, revaccinate the patient. Since the introduction of this method of vaccination no case of the disease has occurred among the yellow fever personnel of the International Health Division, whilst previously accidental infections seemed to be unavoidable.

E. H.

PETTIT (Auguste) & STEFANOPOULO (Georges J.). La vaccination antiamarile à l'Institut Pasteur [Vaccination against Yellow Fever at the Pasteur Institute.]—*Bull. Office Internat. d'Hyg. Publique*. 1934. June. Vol. 26 No 6 pp 1075-1077.

The authors have vaccinated 12 subjects aged 23 to 48 years by the serum-virus method, in 10 cases using horse anti-yellow fever serum, and in the other two human convalescent serum. The results were quite satisfactory and show that horse anti-serum can replace human convalescent serum. E. H.

LAIGRET (Jean) Sur la vaccination contre la fièvre jaune par le virus de Max Theiler. [Vaccination against Yellow Fever with Max Theiler's Virus.]—*Bull. Office Internat. d'Hyg. Publique* 1934. June. Vol. 26. No. 6. pp. 1078-1082

The author advocates the use of three injections of neurotropic virus without any immune serum, as it has been found that the inoculation of small doses of this virus fixed for mice is followed by the development of immunity without any serious general reactions [see this *Bulletin*, Vol. 29, p 572]. E. H.

ADVIER (M.). L'épreuve de Max Theiler (séro-protection de la souris blanche contre le virus amaril neurotrope) pourrait-elle être remplacée par une intradermo-réaction ? [Can Max Theiler's Test (the Serum Protection of White Mice against Neurotropic Yellow Fever Virus) be replaced by an Intradermal Reaction ?]—*Bull. Soc. Path. Exot.* 1934 June 13. Vol. 27. No. 6. pp. 576-578.

The author finds that the intradermal inoculation of 0.1 cc. of a 1 per cent. suspension in saline of infected mouse brain is followed by the development of a dermal reaction in the case of patients immune against yellow fever

Eighteen patients were tested, of whom 5 gave a positive reaction ; this appeared about 24 hours after the inoculation, attained its maximum intensity on the second day, and gradually disappeared on the fourth day. The other 13 patients remained negative. The test was repeated 15 days later with the positive cases and gave the same results.

The blood of these positive cases and three negative ones was tested in mice but gave inconclusive results. Nevertheless 4 out of the 5 cases giving the positive intradermal reaction had been previously vaccinated against yellow fever by the inoculation of neurotropic virus. Three of those giving a negative reaction were then vaccinated by the same method and when tested 15 days later, two of them gave a positive dermal reaction. It would seem, therefore, that this reaction offers distinct possibilities. E. H.

LLOYD (Wray) & MAHAFFY (Alexander F.). The Serum Antibody Titer of *Macacus rhesus* following Repeated Inoculations of Yellow Fever Virus.—*Jl. Immunology*. 1934. Apr. Vol. 26. No 4. pp. 313-320.

The author's results show that no significant alteration took place in the protecting antibody titres of the sera of five rhesus monkeys, immune to yellow fever, after repeated subcutaneous injections of neurotropic yellow fever virus at monthly intervals.

Three of these monkeys had originally been inoculated with neurotropic virus from either mouse or monkey, whilst the other two had been exposed to infection with the viscerotropic virus, both by the bites of infected mosquitoes and infected blood. The sera of these five monkeys were tested for their antibody titre against yellow fever virus by means of intraperitoneal protection tests, using six mice for each test. After the initial titration each immune monkey was tested at monthly intervals for three consecutive months, after receiving an injection of neurotropic mouse virus, and the results clearly indicate that there was no appreciable alteration in the antibody content.

E. H.

DAVIS (Nelson C.). **On the Use of Immune Serum at Various Intervals after the Inoculation of Yellow Fever Virus into Rhesus Monkeys.**—*Jl. Immunology*. 1934. May. Vol. 26. No 5 pp. 361-390.

The effects of immune serum from recovered animals have been tested in a long series of monkeys, and it was found that when injected 24 to 48 hours following the inoculation of virus, the serum was capable of preventing fever or ameliorating the disease in a significant proportion of experimental monkeys.

One of the great difficulties in apportioning the effects of the treatment was the variation in the resistance of the animals themselves. One monkey died with typical yellow fever lesions only 50 hours after the injection of virus, whilst at least a dozen monkeys in the laboratory had incubation periods of 3 weeks or more.

The author's results, given in detail in tabular form, show that 2 to 3 cc. of serum per kilo body weight, given 24 hours after injection of the virus, would save more than half the animals; and if the dosage of virus was small 5 cc. of serum would save at least half of them when given after an interval of 48 hours. Once the disease had definitely developed, as shown by a temperature of 104°F or more, even fantastically large amounts of serum had no effect.

In discussing the use of immune serum for therapeutic purposes in human beings, the difference in the course of the disease in the two hosts, man and monkey, is emphasized. Finally, a case is described of a laboratory worker who seems to have shown a favourable reaction as a result of the combined effects of prophylactic and therapeutic doses, after being accidentally exposed to infection with yellow fever virus.

E. H.

MATHIS (M.). **Vaccination antiamarile du singe, à l'aide de virus vivant provenant du cobaye mort de la maladie expérimentale. [Yellow Fever Vaccination of the Monkey, by Liver Virus obtained from Guinea-pigs dying from Experimental Infection.]**—*Bull. Soc. Path. Exot.* 1934. June 13. Vol. 27. No. 6. pp. 505-510. [12 refs.]

A rhesus monkey was inoculated both intraperitoneally and subcutaneously with a total dose of 2 cc. of a 5 per cent suspension of the brain of a guinea-pig, infected with a strain of yellow fever that had undergone 155 passages in mice and more than 10 passages in guinea-pigs. The monkey showed no signs of disease but from the 2nd to the 5th day virus pathogenic to mice was recovered from its blood. This

animal was repeatedly exposed to infection with yellow fever but was resistant. Three other monkeys also vaccinated in different ways with the virus from guineapigs gave similar results. E H

HOSKINS (Meredith). **Protective Properties against Yellow Fever Virus in the Sera of the Offspring of Immune Rhesus Monkeys.**—*Jl. Immunology* 1934. May Vol 26. No. 5. pp. 391-394

Tests were made with the sera of 5 baby monkeys born of immune mothers. Four of the mothers had been infected with the African (Asibi) strain and one with a Brazilian (S. R.) strain of yellow fever virus before the period of gestation. All the sera were tested when the babies were 6 months old and still feeding upon the mother's milk, and two were bled again 3 months later after having been separated from the mother for 3 weeks.

The results of protection tests in mice show that the sera of all 5 baby monkeys contained protective bodies against yellow fever at the age of 6 months. This protective ability had completely disappeared in the two examined three months later and in addition the sera of two other monkeys respectively 13 and 23 months old, born of immune parents, failed to protect. Subsequently the author has examined the sera of other baby monkeys born to mothers immune to yellow fever. Within 12 hours of birth the sera of these babies was found to contain a relatively high titre of immune bodies, which suggests that the protective bodies may be derived from the mother through the placenta, rather than through the maternal milk.

These interesting observations may be of significance from an epidemiological standpoint as positive protection tests obtained from relatively young children may be the result of an immunity transmitted from the parent to offspring and not the result of actual infection.

E H.

SNIJDERS (E. P.), POSTMUS (S.) & SCHÜFFNER (W. A. P.). Over de beschermende werking van gele-koorts- en denguesera tegenover gele-koortsvirus. [On the Protective Action of Yellow Fever and Dengue Sera against Yellow Fever Virus.]—*Nederl. Tijdschr. v. Geneesk* 1934. July 14. Vol. 78. No. 28. pp. 3253-3272. [Refs in footnotes.] English summary.

The authors discuss the possibility that under certain conditions dengue might provide some grade of immunity against yellow fever, but hitherto the results of all investigations have failed to show the presence of any humoral immunity.

A modification of the mouse protection test was used for the repeated examination of the sera of 20 cases of experimental Sumatran and Javanese dengue, but no evidence was ever obtained of any protective action against yellow fever virus. The examination of the sera of 5 persons working regularly in the yellow fever laboratory showed the existence of weak protective action in two of them, which is believed to be the result of slight (abortive) infection. A comparison of the two diseases shows that in the case of dengue immunity varies greatly in

different individuals and antibodies are not found in the serum, whereas in yellow fever a practically absolute immunity always develops, with abundant antibodies in the serum. *E H*

DAVIS (Nelson C). **Attempts to determine the Amount of Yellow Fever Virus injected by the Bite of a Single Infected *Stegomyia* Mosquito.**—*Amer Jl. Trop Med.* 1934. July. Vol 14. No. 4. pp.343-354

Aedes aegypti infected with yellow fever virus were allowed to feed upon new-born white mice, and the latter were immediately killed and ground up with powdered glass and monkey serum. The resulting paste was mixed with 15 per cent. monkey serum and the liquid removed by centrifuging, this process being repeated four times in order to extract any virus from the tissue. Varying dilutions of the extract were then inoculated into a series of rhesus monkeys. In two experiments the titrations indicated that each mosquito had injected at least 100 infective doses of virus.

Mosquitoes from one lot, which was later used in a feeding experiment on a mouse, were titrated immediately following the infective blood meal and again after ten days. There was a decrease in titre during this interval, which confirms the view that yellow fever virus within the mosquito seems not to increase but rather to diminish in quantity [see this *Bulletin*, Vol 31, p. 81]

From a comparison of the amounts of virus in whole insects and in mice bitten by mosquitoes of the same lot, it would seem that about 1 per cent of the total virus content was injected at each feed *E. H.*

FINDLAY (G. M.) & CLARKE (L. P). **The Susceptibility of the Hedgehog to Yellow Fever. I.—The Viscerotropic Virus.**—*Trans Roy. Soc Trop. Med. & Hyg.* 1934. Aug. 4. Vol. 28 No. 2 pp. 193-200. With 6 figs. on 1 plate [20 refs.]

The authors give details of their interesting observation that the common hedgehog, *Erinaceus europaeus*, is very susceptible to infection with the viscerotropic strain of yellow fever virus.

Twenty-eight animals were infected by the subcutaneous or intraperitoneal inoculation of material from either monkeys or hedgehogs dying of yellow fever, and death invariably occurred in from 4 to 7 days. The naked eye and histological changes were very similar to those met with in man and rhesus monkeys dying of yellow fever, and virus was present at death in the blood, liver and kidneys.

Repeated passages were carried out in hedgehogs with material filtered through Berkefeld filters, and after seven passages the liver filtrate was still virulent for rhesus monkeys. Monkeys immune to known strains of yellow fever virus were also immune to the hedgehog passage strain.

Filtrates of hedgehog livers inoculated intracerebrally into mice produced encephalitis histologically similar to that caused by neurotropic strains of yellow fever virus. The mice died with encephalitic symptoms in from 8 to 18 days, but in subsequent passages in mice the incubation period was gradually reduced.

In view of the wide distribution of the Erinaceidae in Africa it is possible that the hedgehog, and perhaps other Insectivora, may serve as a virus reservoir for the maintenance of infected mosquitoes. *E. H.*

STEFANOPOULO (G. J.). Recherches sur la fièvre jaune expérimentale de la souris et du cobaye [*Studies on Experimental Yellow Fever in Mice and Guinea-pigs.*—*Ann Inst Pasteur* 1934 May. Vol. 52. No. 5. pp 553-595 With 7 figs & 4 diagrams. [38 refs.]

This memoir is a valuable summary of the author's work on the subject and his results are discussed in relation with the results obtained by other workers. Concerning the susceptibility of white mice to the neurotropic virus, the author found that strains of these animals from different localities, including France, Holland and Belgium were equally susceptible. The common grey house-mouse was also found to be susceptible and a strain of yellow fever was maintained exclusively in grey mice for 20 passages in about seven months, without the virus showing any difference in its effects from those obtained in white mice.

When mice were inoculated intraperitoneally the virus was found in the brain, even on the first day, in greater quantities than in the circulating blood, but the blood of any mice that survived either intraperitoneal or intracerebral injections always contained antibodies against the infection.

Guinea-pigs were inoculated intracerebrally with various strains of the virus and found to be very susceptible to virus which had been through a certain number of passages in mice. They generally died of myelo-encephalitis about 8 or 9 days after inoculation, and many of them showed more or less pronounced fatty degeneration of the liver.

The author's results confirm the view that there are differences in behaviour between the viscerotropic and neurotropic viruses, the degree of neurotropism in any particular strain varying according to the number of passages in mice which it has undergone. In using any such strain for the immunization of human subjects, it is necessary to consider the origin, age, and method of preservation of the virus, in the choice of the procedure which should be applied. E. H.

NICOLAU (S.), KOPCOWSKA (L.) & MATHIS (M.). Inclusions produites par le virus de la fièvre jaune chez les souris inoculées sous la dure-mère [*Inclusions produced by Yellow Fever Virus in Mice inoculated beneath the Dura Mater.*—*C. R. Soc. Biol.* 1934. Vol. 116 No. 24. pp 818-820

—, —, — & BAFFÉ (O.). Les inclusions intranucléaires chez le cobaye infecté par voie sous-dure-mérienne avec le virus de la fièvre jaune. [*Intranuclear Inclusions in Guinea-pigs infected Subdurally.*—*Ibid* 820-22.

The authors have studied the brains of 55 mice infected with yellow fever virus, 32 inoculated with the ordinary viscerotropic strain from monkeys, and 23 with a neurotropic strain from mice. All the mice dying as a result of the infection showed inclusions in the nerve cells of the brain and spinal cord. The inclusions were also found in the glial cells, the endothelial cells of the small brain capillaries, the cells of the choroid plexus, the lining of the walls of the lateral ventricles and Purkinje's cells. In Ammon's horn the acidophile bodies reached a diameter of 2-4 μ , but even in these large bodies no internal structure could be detected. The bodies were also easily found in the nuclei of the thalamus, and in the anterior horns of the spinal cord nearest the brain.

The pathological lesions in the central nervous system consist of an encephalo-myelitis, sometimes with destruction of the anterior

horns of the spinal cord, as in Borna disease. By killing mice at daily intervals after inoculation, all stages were obtained in the transformation of the karyoplasm of the nerve cells into yellow fever inclusion bodies. The first bodies appeared on the 4th day in the nerve cells of the brain, and a little later in some of the glial cells. In animals dying 11 to 14 days after inoculation, there was a certain absorption of the brain lesions with a partial and progressive disappearance of the inclusions, first in the brain and then in the spinal cord. The last cells in such cases to show acidophil inclusions are the glial cells.

It is important not to confuse the oxychromatic degeneration of the nucleus, caused by its death, with the presence of inclusions resulting from the resistance of the cell. Inclusion bodies were never found in the hepatic cells of the infected mice.

The virus studied, which had been passaged in the brains of mice for several generations, was found to be not strictly neurotropic, and, contrary to the statements of certain authors, did not produce "septinevritis" in the nervous system of experimental animals.

The second article is concerned with the examination of guineapigs infected by intracerebral inoculation of the virus. The resulting histological changes were almost identical with those recorded above in the case of mice, but it is of interest that inclusion bodies were found in the central nervous system of guineapigs showing no other pathological changes. The characteristic yellow fever bodies are considered to be the oxyphilic spherules occurring singly or in groups, sometimes surrounded by a halo, but always surrounded by karyoplasm which preserves the staining properties. In the nerve cells the inclusions were nearly always multiple (8-10 or even 20), but in the glial cells there were rarely more than 6 inclusions and often only a single large body 2-3 μ in diameter. The cells of the choroid plexus generally showed only single bodies in the nucleus, surrounded by a large halo. The livers of guineapigs dying of this infection showed very much reduced lesions of the liver compared with those in monkeys, and intranuclear inclusions were only found very exceptionally. E H.

- i. NICOLAU (S), KOPCIEWSKA (L.), BALMUS (G.) & MATHIS (M.). Inclusions provoquées par le virus de la fièvre jaune chez le singe. [Inclusions produced by Yellow Fever Virus in the Monkey.]—*C. R. Soc. Biol.* 1934. Vol. 116. No. 25. pp. 944-947.
- ii. —, — & MATHIS (M.). Sur les inclusions amariles; leur rapport avec les inclusions provoquées par d'autres ultravirus. [Their Relation to the Inclusions produced by other Virus Infections.]—*Ibid.* pp. 947-950.

i. As a result of the examination of 14 *Macacus rhesus* infected in various ways with yellow fever virus (intracerebrally, intraperitoneally and by bites of mosquitoes) the authors have arrived at the following conclusions:—

With all three methods of infection the alterations in the nervous system are identical but very slight, consisting of a more or less distinct proliferation of the glial cells of the brain and spinal cord and other changes in the nervous tissue itself. The inclusion bodies are sometimes present in the nuclei of the nerve cells of the brain, also in Purkinje's cells, and exceptionally in certain cells of the spinal cord. The glial cells contain inclusion bodies more often than the ganglion cells. When stained with Mann, the inclusions frequently appear blue,

surrounded by a halo without the characteristic oxyphilic granules. In all the monkeys examined (10) the nerve cells of the spinal ganglia contained typical intranuclear inclusion bodies, which were found also in certain intracardiac nerve cells and in the walls of the intestine. They were absent from the cells of the parotid, pancreas, cardiac muscle, lymphatic ganglion, lung, suprarenal and kidney. In the spleen, in addition to the lesions described by previous authors, very well developed inclusion bodies were often found in the large endothelial cells. The histological changes were identical in monkeys dying 5 or 6 days after inoculation, and those dead after 15 days. The livers of all the monkeys showed the characteristic changes and inclusion bodies.

11 This article is a further discussion of the interpretation of the nuclear changes observed in certain cells of animals infected with yellow fever virus. The virus is assumed to enter the nerve cell and become centred in the nucleus which as a result undergoes various changes. The nucleoplasm first becomes granular, then particles of chromatin appear among the granules. These chromatic bodies become rounded off and surrounded by a halo and either single or multiple oxyphilic centres appear in these bodies. These oxyphilic changes gradually extend until the bodies are entirely acidophile, surrounded by the remains of the nucleus which preserves its original staining qualities. In addition to these changes some of the nuclei of cells which presumably have succumbed to the action of the virus undergo oxyphilic degeneration of the nucleus, involving the whole of the chromatin, which forms irregular masses of degenerated material sometimes arranged around the periphery of the nucleus. The authors found that this type of degeneration could be produced in the livers of rabbits by the inoculation of tuberculin or vibron septique toxin.

Finally, as previously noted by COWDRY and KITCHEN [*Science*, Vol. 69, p. 252] it is considered that there is a close resemblance between the yellow fever inclusion bodies of the nerve cells and the Joest-Degen bodies found in Borna disease. E. H.

NICOLAU (S) KOPCOWSKA (L.) & MATHIS (M). Inclusions amarrées chez des animaux réputés réfractaires à l'action pathogène du virus de la fièvre jaune [**Yellow Fever Inclusion Bodies in Animals considered Refractory.**—*C. R. Soc. Biol.* 1934. Vol 116. No. 27. pp. 1332-1334.

Rabbits, including both young and adults, were inoculated intracerebrally, intraperitoneally or into the sciatic nerve with either viscerotropic yellow fever virus from monkeys, or neurotropic virus from mice. Inclusion bodies characteristic of yellow fever were found in the nerve cells and glial cells of the central nervous system of many of the 22 animals examined, but these bodies were not so numerous nor so well developed as those in mice and guinea-pigs. The bodies were never found in the liver cells of inoculated rabbits. E. H.

HAAGEN (Eugen). **Yellow Fever Virus in Tissue Culture.**—Reprinted from *Arch. f. Experim. Zellforschung*. 1934. Vol. 15. pp. 405-421. With 8 figs.

This article contains a useful summary of the author's results of studying yellow fever virus in tissue culture including full details of

the methods employed [see this *Bulletin*, Vol. 29, p. 577 and Vol. 30, p. 357].

The most satisfactory medium was found to be normal monkey serum diluted ten times with tyrode solution containing living fowl-embryo cells. Living cells are essential for growth. The histological examination of rabbit tissues infected *in vitro* with yellow fever virus showed intranuclear changes in the affected cells which were most distinct in the corneal and testicular tissues. The nuclear chromatin showed acidophile granulation similar to the changes in the tissues of infected animals. E. H.

MATHIS (Maurice). Agressivité et pontes comparées du moustique de la fièvre jaune en conditions expérimentales. [Comparison of the Aggressiveness and Egg-laying of *A. aegypti* under Experimental Conditions.]—*C. R. Soc. Biol.* 1934. Vol. 115. No. 14. pp. 1624-1626.

Using *Aedes aegypti* bred under experimental conditions, it was found that when fed on man the adult females only exceptionally required a second meal of blood before laying eggs. On the other hand, those fed on monkeys, rabbits, or guineapigs, generally required two meals before laying, a fact which suggests that man is the most favourable host. In addition, the number of eggs per female laid by mosquitoes fed on various hosts was greater when human blood had been ingested as shown by the following table:—

Number of eggs per female fed on				
	Man.	Monkey.	Rabbit.	Guineapig
First egg laying ...	46	34	38	35
Second egg laying ...	50	42	33	35
Total ...	96	76	71	70

E. H.

MATHIS (Maurice) & BAFRET (Odette). Développement larvaire du moustique de la fièvre jaune en culture pure d'Euglènes. [Development of Larvae of *A. aegypti* in Pure Culture of *Euglena*.]—*C. R. Soc. Biol.* 1934. Vol. 116. No. 19. pp. 317-319.

The authors obtained eggs of *Aedes aegypti* which were alive but bacteriologically sterile. They allowed them to hatch in several media, testing for sterility from time to time. In peptone water the larvae died in a few days, none having passed beyond the second stage. When a fragment of brain was added to the peptone water, no better results were obtained [but it is not clear whether the brain was autoclaved in the medium or added aseptically to the sterile peptone water]. Living *Euglena* were available in pure culture. In this the larvae hatched and fed well, becoming adults very quickly. Tests for bacteriological sterility were made, but the technique is not mentioned: [it is not clear that the workers excluded anaerobes or organisms which live at room temperature better than at 37°C]. P. A. Buxton.

TAYLOR (A. W.). A Note on Mosquitos breeding in Tree-Holes in Northern Nigeria.—*Bull. Entom Res.* 1934. July. Vol 25. Pt. 2. pp. 191-193.

Although the climate of Northern Nigeria is very different from that of the Southern Provinces, a true tree-hole mosquito fauna nevertheless exists at least as far north as Gadau (lat. 12°N.). Here, near the European station, 11 holes were discovered in as many trees belonging to 7 species. From the beginning of July, 1931, until the second week of September the holes contained water, and the larvae found on periodic visits were bred out in the laboratory. No preference on the part of the mosquitoes for particular species of trees was observed.

Like the climate itself, the tree-hole mosquito fauna of N Nigeria differs widely from that of the South. *Aedes metallicus*, *A. furcifer* and *A. unilineatus*, which are absent, and *A. simpsoni*, which is rare, in the South, abound in tree-holes in the North. *Aedes africanus*, *A. stokesi*, *A. apicoargenteus*, *A. wellmani* and *A. longipalpis*, all common in Southern tree-holes, were not met with during the present survey, in the course of which, in addition to those already mentioned, the following species were reared:—*Aedes luteocephalus*, *A. aegypti*, *Culex nebulosus*, *C. decens* and *Megarhinus brevipalpis*.

The immersion in water of debris and scrapings, taken from the eleven tree-holes in January and February, resulted in the breeding out of *Aedes simpsoni* from 10 holes, *A. unilineatus* from 5, *A. metallicus* from 2, and *A. aegypti* from a single hole, showing that in N. Nigeria the viability of tree-hole breeding *Aedes* is preserved during the dry season. It is noted that, among the tree-hole breeders found, apart from *A. aegypti*, at least *A. luteocephalus* and *A. simpsoni* are experimentally capable of transmitting the virus of yellow fever.

E. E. Austen.

HAAGEN (E.). Das Gelbfieber. Neuere Forschungsergebnisse. [Yellow Fever. Recent Investigations.]—*Deut. Med Woch* 1934. June 29. Vol 60 No. 26. pp. 983-988. [55 refs.]

A general summary of recent work on the subject.

E. H.

ANNALES DE MÉDECINE ET DE PHARMACIE COLONIALES 1934 Jan-Feb-Mar. Vol. 32. No. 1. pp. 78-84 —L'état actuel de la vaccination contre la fièvre jaune. [The Present Position of Vaccination against Yellow Fever.]

A useful summary of the subject.

E. H

RELAPSING FEVER AND OTHER SPIROCHAETOSSES.

CUNNINGHAM (J.), THEODORE (J. H.) & FRASER (A. G. L.). **Further Observations on Indian Relapsing Fever. Part I. Types of Spirochaetes found in Experimental Infections.**—*Indian Jl Med Res.* 1934. July. Vol 22. No. 1. pp 105–155. With 25 charts & 1 fig [29 refs.]

This article is a valuable contribution to the problem of the nature and origin of the various serological types of spirochaetes occurring in cases of Indian relapsing fever.

Cunningham previously showed that the spirochaete of the relapse differed serologically from the spirochaete present in the first attack, and that these two types alternated with each other [see this *Bulletin*, Vol. 23, p. 112]. In the present investigation these observations have been greatly extended and the study of experimental infections in squirrels (*Sciurus palmaris*) and monkeys, has resulted in the isolation of seven additional serological types, bringing the total up to nine. The majority of these new types were originally found in second relapses (third attacks) which occurred in the same animal in about 4 per cent. of the cases. These spirochaetal types were merely serological entities and showed no morphological differences. In the case of two types (H and I), however, differences were observed in the form of attack produced. The types are referred to by letters, "A" is the original first attack type; "B" the first relapse type; "D," "E," "F," "G" and "H" were obtained from second relapses; "C" also occurred in second relapses but was originally isolated from a mixed type infection; "I" was found in a first relapse.

Types A, B, D and E were definite and stable, but the remainder were more liable to change. Type F was rarely found and did not persist for many subpassages, being generally supplanted by Type B.

A study of agglutinin curves following infections with the various types showed four forms following either the first attack or the relapse.

(a) A simple response to the type of spirochaete inoculated, or in the case of the relapse, to this type.

(b) A series of one or more subsidiary rises to other types following the main curve in succession, the summit of each succeeding curve being lower than its predecessor.

(c) One or more subsidiary curves to other types arising simultaneously with the main response to the type causing the infection (or the relapse).

(d) A combination of the two preceding forms (b and c) in the same infection or relapse.

Experiments to determine the origin of the various types gave the conception of an organism composed not so much of pre-existing antigenic elements as of potential variants. The change of type seems to be a gradual process and occurs at different times during the disease. Occasionally infections with more than one type of spirochaete have been observed.

A study of the spirochaetes in 506 first relapses shows that :—

(a) The appearance of any particular type in an infection invariably debars it from any further participation in the disease in the same

animal. (b) The primary types A and B are definitely complementary to each other. The remaining types occupy an intermediate position although C, D and E seem more closely related to B, and G to A; but there are no clearcut distinctions between them, nor can they be divided into associated groups.

An examination of a series of first relapses derived from three strains obtained from different human sources showed that the majority of them were due to types A and B. When the second relapse strains were followed through a succession of relapses it was found that there was a persistent tendency to revert to the primary types A and B.

Types H and I produced prolonged attacks (up to 19 and 20 days) and the spirochaetes seemed unable to develop in any numbers. The types either remained pure throughout the whole attack or changed to another type about the 11th day or later. The primary types A and B, and also D, E and G were found to be very stable on subpassage as long as the transfers were carried out 24 to 48 hours after infection.

Changes of type without the intervention of a relapse were observed on rare occasions. Types C, F and G were those most frequently involved.

The article is accompanied by numerous tables and charts illustrating the various points dealt with by the authors. [It should be read in its entirety by those interested in the subject.] *E. Hindle.*

ADVIER (M.), ALAIN (M.) & RIOU (M.). Fréquence et aspects cliniques de la fièvre récurrente à spirochète de Dutton en Afrique Occidentale Française. [Frequency and Clinical Aspects of Tick Fever (*S. duttoni*) in French West Africa.]—*Bull. Soc. Path. Exot.* 1934. June 13. Vol. 27. No. 6. pp. 593-598.

During the course of two years the authors have observed 46 cases of tick fever among the patients of the hospitals and dispensaries. These patients comprised 13 Europeans and 33 natives, who with two exceptions had acquired the infection in Dakar or other parts of Senegal.

The difficulties in the diagnosis of this disease are well exemplified in these cases for only 25 of the patients showed spirochaetes in the blood and in these the parasites were usually extremely rare. The remaining 21 cases were diagnosed only by the inoculation of their blood into rats.

The clinical symptoms alone do not readily enable one to distinguish this disease from any other febrile infections. General indications comprise a sudden access of fever persisting for more than a few hours accompanied by a saburral state of the alimentary canal, nausea and vomiting, headache and muscular pains in the limbs. There is an absence of stupor or excitation, also of erythema or pharyngitis. Generally albuminuria is present but is only very slight and does not increase. The only complication, observed in 5 Europeans and 4 natives, was the result of invasion of the meninges, or of the central nervous system, by the spirochaete.

The disease is evidently widespread in French West Africa, but is generally benign, with a favourable prognosis. Nevertheless it requires very energetic therapeutic treatment to effect a cure, involving a course of injections of 914 or sulpharsenol, with increasing doses, as in the case of syphilis. *E. H.*

MATHIS (C.) & DURIEUX (C.). Existence d'un foyer endémique de typhus récurrent, à Saint-Louis du Sénégal. [The Existence of an Endemic Centre of Relapsing Fever, at St. Louis, Senegal.]—*Bull. Acad. Méd.* 1934. June 19. 98th Year. 3rd Ser. Vol. 111. No. 23 pp. 839-844.

The authors have tested the infectivity of rodents collected in St. Louis and the neighbourhood by inoculating emulsions of their brains into white mice. Two lots each of 5 *Epimys decumanus*, collected in the south of the town, and one lot of 5 *Epimys golonda campanae* collected in the Sor district were found to be infected. Negative results were obtained with 2 lots respectively of 7 and 8 *Arvicanthus rufinus* captured outside the town, and a lot of 9 *Mastomys coucha* and 1 *A. rufinus*.

The strain isolated from the St. Louis rats was found to produce typical relapsing fever when inoculated into a human subject. After an incubation period of 5 days this patient had five attacks of 2 to 5 days each, alternating with apyretic intervals of 2 to 6 days in the course of a month, when the disease was cured by arsenical treatment.

Mice are susceptible to infection with this strain, but young rabbits, guineapigs and one monkey, *Cercopithecus patas*, all showed very slight infections.

The results of a cross-immunity experiment support the view that this strain is identical with the Dakar strain of *S. duttoni*, commonly referred to as *S. duttoni* var. *crocidurae*.

Finally, the authors discuss the nature of the spirochaete described under the name of *Spirillum pitheci* which was discovered by THIROUX and DUFOUGERÉ¹ in the blood of a *Cercopithecus patas* at St. Louis.

Its general description and the results of an experimental study of the strain by LAVERAN and PETTIT² suggest that this spirochaete is probably also identical with the Dakar strain, which seems to have a wide distribution in French West Africa. E. H.

COLEMAN (George E.). Relapsing Fever in California. III. The Carrier Condition; Epidemiology. IV. Cross-Immunity: Susceptibility of Sierra Golden Mantle Ground Squirrels.—*Jl. Infect. Dis.* 1934. May-June. Vol. 54. No. 3. pp. 281-294. [42 refs.]; pp. 295-304. [11 refs.]

After a full discussion of the subject the author gives the results of experiments with the Californian strains of relapsing fever spirochaetes.

In mice, infection of the brain did not persist after the blood had ceased to be infective. Moreover, attempts to reactivate possible latent infections by the inoculation of vaccines into recovered mice also gave negative results. With reference to the epidemiology of the disease, the possibility of rodent reservoirs is supported by the observations of PORTER, BECK and STEVENS also in California [see this *Bulletin*, Vol. 30, p. 361], but in the district they visited the author, three months previously in March, failed to recover any spirochaetes from nine adult squirrels and a chipmunk, and also no ticks were found. The positive findings three months later were probably in young animals recently infected in their burrows by nymphal ticks.

¹ *C. R. Acad. Sci.* 1910. Vol 150, pp. 132-135

² *Bull. Soc. Path. Exot.* 1910, Vol. 3, pp 419-422.

In the cross-immunity tests attention was paid to the degree and duration of the immunity and the relative virulence against each other of the two strains to be tested. A close relation was found to exist between various Californian strains even though some of these strains had their origin several hundred miles apart. Furthermore, serological evidence was obtained favouring the probability of a close relationship between the Texas and California strains.

Five Sierra golden-mantle ground squirrels, *Callospermophilus chrysoderus*, from Plumas County, were tested for spirochaetes in various ways—daily examinations of the blood, subinoculations into mice, agglutination, protection tests, etc.—but failed to give any evidence of infection. Finally, three were inoculated in various ways with three strains of the spirochaetes but failed to show any signs of infection. Moreover, their blood serum, both before and after the injection of these strains, failed to protect mice against infection with the same strains and also an additional one. It seems probable, therefore, that this species is immune against relapsing fever. E. H.

VARDEN (Arthur E.). **Relapsing Fever in Children.**—*Amer. J. Dis. Children*. 1934. Aug. Vol. 48. No. 2. pp. 359–372. With 2 figs. [32 refs.]

A general review of the subject followed by reports of six cases in California, all of whom were presumably infected with the tick-transmitted variety of relapsing fever in either Lake Tahoe region or Big Bear Valley. The symptoms in the main resemble those of the African form of the disease.

[The author's references contain numerous mistakes: LIVINGSTONE (David) is spelt without the final e; "Sargent and Folley" presumably means SERGENT and FOLEY; "Hendle" is written for HINDLE; and "Manson, Philip H." instead of P. H. MANSON-BAHR] E. H.

ZAVATTARI (Edoardo). Sulla asserita presenza dell' *Ornithodoros moubata* in Libia e sull' asserita conseguente presenza in Libia della febbre ricorrente da *Spirochaeta duttoni*. [*Are Ornithodoros moubata and Relapsing Fever Present in Libia?*]—*Arch. Ital. Sci. Med. Colon.* 1934. May 1. Vol. 15. No. 5. pp. 347–352. English summary (4 lines).

GASPARE (Lodato). Risposta alla nota del Prof. Zavattari "Sull' asserita presenza dell' *O. moubata* in Libia."—*Ibid.* pp. 353–359. English summary (3 lines).

FRANCHINI (Giuseppe). A proposito di un articolo del Prof. Zavattari "Sull' asserita presenza dell' *Ornithodoros moubata* in Libia e sull' asserita conseguente presenza in Libia della febbre ricorrente da *Spirochaeta duttoni*."—*Ibid.* pp. 360–363. English summary (3 lines).

A difference of opinion as to whether *Ornithodoros moubata* occurs in Libia, Zavattari asserting that it does not and that therefore there is no danger of the spread of relapsing fever, Gaspare and Franchini maintaining the contrary. A. G. B.

ZIMMERLI (E.). **The Problem of Bronchial Spirochaetosis.**—*Tubercle*. 1934. Aug. Vol. 15. No. 11. pp. 481–497. With 2 text figs. & 10 figs. on 1 plate. [45 refs.]

A good critical review of the subject. The author's conclusions are as follows:—

" (1) *Spirochaeta bronchialis* has never been established as a species of its own, either morphologically or by experiment on the animal, or in any other way.

" (2) Spirochaetes of various shape and size may be found in any sputum, haemorrhagic or non-haemorrhagic, provided that the specimen is not washed after expectoration. In 30 out of 31 cases of pulmonary tuberculosis I have been able to demonstrate post mortem that those spirochaetes come from the mouth and are not found below the bifurcation. Therefore, the occurrence of such organisms in the sputum allows of no practical conclusions.

" (3) 'Bronchial spirochaetosis' is not established as a disease *sui generis*, its only constant symptom according to the authors being the presence of spirochaetes in the sputum.

" (4) If a hysterical patient or a malingerer draws blood out of his gums, the product is sure to contain numerous spirochaetes: this has to be considered first in differential diagnosis to 'bronchial spirochaetosis.'

" (5) An appeal is made to our colleagues of Ceylon to state their experience in cases of chronic haemorrhagic bronchitis on that island. If such a clinical picture is common among the Cingalese, how is it characterised? "

E. H.

SINGER (Ernst), KOTRBA (Jan) & FISCHL (Viktor). Die Bindung von Arzneimitteln an Spirochäten und Trypanosomen in Vitro. [The Combination of Therapeutic Agents with Spirochaetes and Trypanosomes in Vitro.]—*Ztschr. f. Hyg. u. Infektionskr.* 1934. May 25. Vol. 116. No. 2 pp. 133-137. [11 refs.]

The authors have applied their micro-chemical method of analysis [*ante*, p. 510] to the examination of *Spirochaeta recurrentis* and *Trypanosoma brucei*, respectively, exposed to the action of either atoxyl or solganal *in vitro*. In addition, the effect of adding liver extract, and in the case of atoxyl other organ extracts, was tested

The results are given in tabular form and are said to support the view that the method of action of chemotherapeutic substances is a complex phenomenon falling into three phases—(1) A physico-chemical adsorption of the substance by the cell of the pathogenic organism, (2) a change in this adsorbed substance as a result of the vital activities of the cell, resulting in the formation of an actual poison, and (3) finally the completion of cure by the immune substances of the organism of the host.

[The figures given in the tables show such individual variations that making every allowance for difficulties of analysis, the results hardly seem sufficient to justify all the conclusions drawn from them by the authors.]

E. H.

FISCHL (Viktor) & SINGER (Ernst). Gewinnung und Verhalten arzneifester Recurrenzspirochäten. [The Production and Behaviour of Drug-Fast Relapsing Fever Spirochaetes.]—*Ztschr. f. Hyg. u. Infektionskr.* 1934. May 25. Vol. 116. No. 2. pp 138-145. [17 refs.]

A strain of European relapsing fever spirochaetes in mice was made resistant against solganal after only 15 passages. Mice infected with the original strain were inoculated intramuscularly with a dose of

1/10,000 gm. per 20 gm. mouse; 24 hours later the blood of the treated mouse was inoculated into normal mice and these in turn given a larger dose of the drug and the process repeated until a dose of 1/100 gm. per mouse was reached.

The properties of this solganal resistant strain were then compared with those of the original strain by exposing both to the action of various other drugs, including nine gold preparations, also neosalvarsan, and salts of rhodium and osmium. In every case the solganal-resistant strain was found to be also resistant against these other drugs, although the normal strain was susceptible. On the other hand, both strains seemed to be identical as regards their electrical properties, and also in their non-persistence in the central nervous system. Mice infected with the resistant strain were treated with two gold compounds and neosalvarsan respectively, and the plasma, blood cells, and spirochaetes subsequently analysed for the presence of gold or arsenic. In every case the spirochaetes showed no trace of these substances although one or the other was present in the plasma and red-cells. Also under such conditions normal spirochaetes have been shown to contain either gold or arsenic [*ante*, p. 510]. The results, therefore, support the view that in drug-resistant strains there is an alteration in the surface layer of the micro-organism, and the drug is no longer able to become attached to it.

E. H.

VIOLLE (H.) Action du ricinoléate de soude sur divers spirochètes. [The Action of Sodium Ricinolate on Various Spirochaetes.]—*C. R. Soc. Biol.* 1934. Vol. 116. No. 25. pp. 1004-1007.

Various spirochaetes comprising *S. buccalis*, *S. ictero-haemorrhagiae*, *S. anserina*, *S. duttoni* and certain water strains were exposed to the action of solutions of sodium ricinolate. In every instance the spirochaetes were found to have been killed, as tested both by cultures and animal inoculations, even with dilutions of 1:1,000 in media containing proteins.

E. H.

BRUMPT (E.). Hémopéritoine chez des cobayes infectés par le spirochète de la fièvre récurrente du Turkestan. [Haemoperitoneum in Guinea-pigs infected with the Spirochaete of Turkestan Relapsing Fever.]—*Bull. Soc. Path. Exot.* 1934. June 13. Vol. 27. No. 6. pp. 510-512.

The relapsing fever of Central Asia transmitted by *Ornithodoros papillipes* [syn. *O. crossi* Brumpt], is considered to be identical with Persian relapsing fever. Consequently the name *Spirochaeta persica* Dschunkovsky 1912 has priority, and according to the author, *S. usbekistanica* Pikoul 1928, and *S. sogdianum* Nicolle and Anderson 1928, should also become synonyms. Hitherto, however, the susceptibility of guinea-pigs to the Persian strain has not been established. Working with a strain of relapsing fever obtained from Russian Turkestan transmitted by *O. papillipes*, and experimentally by *O. moubata*, the author has studied the pathological changes occurring in infected guinea-pigs, which are particularly susceptible to this strain. It was found that out of 22 infected guinea-pigs, 19 died, and in 10 of these the peritoneum contained a quantity of non-coagulated blood together with a large clot apparently arising from the anterior pole of the spleen.

E. H.

SCHARRER (Berta). Ueber die Verweildauer von Hühnerspirochäten im Zentralnervensystem von Hühnern und Tauben. [The Persistence of Fowl Spirochaetes in the Central Nervous System of Fowls and Pigeons.]—*Ztschr. f. Hyg. u. Infektionskr.* 1934. May 25. Vol. 116 No. 2. pp. 206–208.

The central nervous system of birds infected with fowl spirochaetosis was found to remain infected not more than 1–2 days after the blood and other organs of the body had become negative.

Of 6 fowls inoculated with a Pomeranian strain of the disease, killed respectively 1, 2, 3, 5, 9 and 31 days after the disappearance of spirochaetes from the blood, only the first fowl showed any brain infection. Similar results were obtained with four fowls infected with a Greek strain, and also with pigeons infected with these two strains and a Paris one. It would seem, therefore, that fowl spirochaetosis does not usually produce any residual infection in the central nervous system.

E. H.

SCHARRER (Berta). Ein serumfreier Nährboden für Hühnerspirochäten. [A Serum-free Culture Medium for Fowl Spirochaetes.]—*Zent f. Bakt. I. Abt. Orig.* 1934. Aug. 7. Vol. 132. No. 3/4, pp. 243–244.

The author finds that the medium recommended by Li YUAN-PO for the cultivation of *S. recurrentis* [see this *Bulletin*, Vol. 30, p. 366] gives good results with the fowl spirochaete, equal to any obtained with ordinary media containing serum. Subcultures were made every 4 to 8 days and the cultures grown at 33°C.

E. H.

MEDULLA (Candido). Nuovi casi di febbre ricorrente osservati in Cirenaica — *Arch Ital Sci Med. Colon* 1934. May 1 Vol. 15. No 5 pp 335–346 With 9 figs. English summary (6 lines).

LEPTOSPIROSIS.

SCHÜFFNER (W.). Recent Work on Leptospirosis.—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1934. June 30. Vol. 28. No. 1. pp. 7–31. With 2 plates & 8 text figs. [35 refs.] (Reply to Discussion pp. 36–37. With 1 fig.)

This valuable article summarizes recent work on leptospirosis with special reference to the investigations of the author and his colleagues in Holland, and also contains the description of a divergent strain of the infective agent, *Leptospira canicola*, causing a specific canine disease.

The prevalence of Weil's disease in Holland is indicated by the fact that during the last 10 years 452 cases have been diagnosed either serologically or by isolation of leptospirae, and of these 46 died, a case fatality of 10·2 per cent. Although cases may occur in any month of the year, there is a definite accumulation of them in late summer and early autumn, the result of infection among bathers and swimmers. Details are given of the ways in which infection may be acquired and

the influence of various external factors on the leptospira. Experiments by RUVS show that these organisms can survive for at least a few hours in water of any degree of salinity, but the survival period in waters of a high degree of salinity is less than in waters with a low degree. This may explain the high incidence of the disease in Southern Holland (low salinity) compared with the much lower incidence in Northern Holland (high salinity).

All the local epidemics studied were found to be invariably accompanied by heavy murine infections (up to 56 per cent. infected) and the author considers that human infections are the result of the contamination of the water by the urine of these infected rats. It is probable, however, that infection may pass from one rat to another by way of food polluted with urine, or by sexual intercourse.

The bacteriological diagnosis of the disease is based on (a) detecting leptospira in freshly drawn blood by direct microscopical examination, (b) cultivation, (c) serological reaction. The first of these methods is rarely successful since even at high centrifuge speeds frequently the organisms are not precipitated. Cultivation is generally more successful when the patient's blood is collected during the first 3 or 4 days but parasites may be present as late as the 8th or 10th day. Serological tests after the disease has run its course make it possible to test the nature of suspicious infections, for the agglutinating and lytic properties of the serum persist and remain well developed for at least 8 years. Agglutination tests are best carried out with the aid of leptospira killed and preserved in 0.5 per cent pure formalin. Suspensions of these kept for two years agglutinate in an unimpaired manner, up to the highest dilutions, and do not lyse in the same way as living organisms. Moreover, they are very convenient for the application of absorption tests.

Previously only one strain of *S. icterohaemorrhagiae* had been met with in Holland, but in November, 1931, the author cultivated a strain from the urine of a dog, which, although morphologically identical with the ordinary type, presents many points of difference. It has only a slight virulence for guineapigs, does not cause jaundice; leptospira never appear in the blood and only for a short time in the peritoneal cavity of inoculated animals, the virulence can be raised by passages through guineapigs, but even in fatal cases, produced after two or three passages, jaundice does not develop, after recovery the guineapigs almost invariably become carriers, in white mice the behaviour of the parasite is similar to that in guineapigs. Moreover, by serological tests the new strain is found to be sharply distinguished from the typical Weil strains. It has only once been identified in a human patient and hitherto has never been found in rats. In view of its divergent characters the author, in conjunction with KLARENBECK, considers it to be a distinct species, for which the name *Leptospira canicola* is proposed. E. Hindle.

BAGIOT (Ch.) & DELBOVE (P.). Spirochétose ictérique en Cochinchine. [*Spirochaetal Jaundice in Cochin China.*—*Bull. Soc. Path. Exot.* 1934. Apr. 11. Vol. 27. No. 4. pp. 347-354. With 1 chart.

A detailed description of two cases of this disease, which in one instance gave a syndrome of "typhus hépatique" or acute infectious hepatic nephritis, with serious meningeal symptoms; whilst in the second instance there was only slight hepatitis with meningism.

During the course of the disease the serum of one of the patients agglutinated various strains of *B. proteus* X19; the agglutination, however, was only feeble and disappeared before convalescence. In both patients the blood was found to contain spirochaetes, as tested by inoculation into guinea-pigs, which all became infected after an incubation period of 7-10 days, and showed typical symptoms of spirochaetal jaundice.

The authors are of the opinion that this disease is probably fairly common in Cochin China, but is often overlooked owing to the difficulty of diagnosis
E. H.

ABE (Toshio). Ueber den Erreger des "Hasami"-Fiebers (*Spirochaeta autumnalis*). [The Causative Agent of "Hasami" Fever (*Spirochaeta autumnalis*)]—*Japanese Jl. Experim. Med.* 1934. June 20. Vol 12. No. 3. pp. 255-270.

The author made a detailed study of 9 cases of this infection occurring during the autumn of 1931 in the district of Hasami, Nagasaki. The results show that the causative organism, *Spirochaeta autumnalis*, commonly referred to as "Akiyami A" strain, is serologically distinct from *S. icterohaemorrhagiae* and *S. hebdomadis* ("Akiyami B"). Guinea-pigs inoculated with this strain developed jaundice after an incubation period of 4 to 12 days and died one or two days later.

E. H.

APPELMAN (J. M.) Het isoleeren van *Leptospira icterohaemorrhagiae* uit water—*Antonie van Leeuwenhoek Nederl. Tijdschr. v. Hyg., Microbiol. en Serol.* 1934 Vol. 1. No. 1. pp. 22-26 [Ante, p. 514]

KINGO (S.) Histologische Veränderungen des Gehirns bei der Weil'schen Krankheit—*Fukuoka Acta Med.* (*Fukuoka-Ikwadaingaku-Zasshi*) 1934 Aug. Vol 27 No. 8 [In Japanese German summary pp. 112-113]

PETZETAKIS (M.) Ueber die Empfänglichkeit der Feldmaus für die Spirochaeta-ikterogenes-Spirochäten—*Wien. Klin. Woch.* 1934 Aug. 24 Vol 47 No. 34. p. 1048. [Ante, p. 95]

RAT-BITE FEVER.

LEVADITI (C.), SCHOEN (R.) & VAISMAN (A.). Mode de propagation de la spirochétose provoquée par le *Spirochaeta muris*. [The Method of Propagation of *Spirochaeta muris* Infection.]—*C. R. Soc. Biol.* 1934. Vol. 116. No. 25. pp. 934-937. With 2 figs.

The authors have shown previously that *Spirillum minus* in white mice can be transmitted from the mother to the offspring either *in utero* or by the ingestion of infected milk, and in the present publication extend these observations.

With regard to the prevalence of the spirillum in the mammary glands of white mice, out of 18 lactating females from Marchezais 17 contained the organism, whilst the number of uterine infections, in the

same lot, was 7 out of 15. In another series of mice from the Institut Pasteur, Paris, 3 out of 4 showed *S. minus* in the lactating mammary glands. Also a wild mouse caught in the laboratory showed a heavy infection not only in the glands, but also in the secreted milk. Young rats and mice were infected *per os* by feeding them with milk containing *S. minus*, and by killing the animals after various intervals and examining their tissues the spirilla were found to penetrate the wall of the alimentary canal within 2 to 3 hours. Infection *per os* therefore seems to be a certain method of propagating the disease among rodents.

E. Hindle

ARIMA (Shizuka) **Experimental Inquiry into the Transmission of Rat-Bite Fever among Rats, Part II. Successful Transmission of Rat-Bite Fever by feeding Infected Organs to White Rats.**—*Philippine Jl. Sci.* 1934. Feb Vol 53. No 2 pp 179-181

White rats were found to be partially resistant to Manila strains of *Spirillum minus* as shown by the fact that of two rats which had been exposed to infection by ingestion, and subsequently inoculated subcutaneously with material rich in spirilla, one remained completely negative as tested both by dark ground examination of the blood and subinoculation into guineapigs. In the other rat one spirillum was found in the blood on the 42nd day and a guineapig inoculated with a suspension of its organs developed the disease.

Two rats which had been fed repeatedly on material rich in *S. minus* remained negative to microscopic examination, but their organs inoculated separately into guineapigs produced the infection. In another experiment one rat was positive and the other negative as tested in the same way. The results, therefore, suggest that rat-bite fever may be transmitted among rats by the ingestion of dead infected rats.

E. H

RIPLEY (Herbert S) & VAN SANT (Helen M) **Rat-Bite Fever acquired from a Dog.**—*Jl. Amer. Med. Assoc.* 1934. June 9. Vol 102. No. 23. pp. 1917-1921. With 3 figs. [34 refs.]

A description of two cases of this disease apparently acquired in the laboratory from a dog.

One of these patients contracted the infection after mere contact with infected tissues, and as no skin abrasion was noted, it is suggested that the spirillum is able to penetrate the skin. Kahn tests on both patients were strongly positive and also in a dog that had been inoculated from one of them, but the Kolmer Wassermann reaction was usually negative though occasionally weakly positive. Mice, guineapigs and two dogs were infected by the inoculation of blood from the patients, and spirilla found by dark ground examination in the blood of the mice. On the other hand, the guineapigs never showed spirilla in the peripheral blood but all succumbed to the infection within two months of inoculation. A patient suffering from dementia paralytica was inoculated with infected mouse blood and developed a typical lesion and symptoms of rat-bite fever, which were terminated by treatment with arsphenamine. The author recommends a course of three to six treatments of this drug. The flagella on the spirilla were demonstrated only with Burri's india ink method.

E. H.

LORANDO (N.) Sur un cas de sodoku en Grèce [A Case of Sodoku in Greece.]—*Bull. Soc. Path. Exot.* 1934. Apr 11. Vol. 27. No 4. pp. 304-306.

The description of a typical case of rat-bite fever following the bite of a sewer rat in Cephalonia Island. The patient recovered after a course of five injections of neosalvarsan, commencing with a dose of 0.15 gm. and gradually rising to a final dose of 0.75 gm. *E. H.*

SEREFETTIN (O.) Un cas de sodoku à Istanbul. [A Case of Sodoku in Istanbul.]—*Bull. Soc. Path. Exot.* 1934. June 13. Vol. 27 No. 6. pp 512-515

This is the 5th case of the disease to be recorded from Istanbul, but the first in which the diagnosis was confirmed by inoculation into guinea-pigs. The clinical symptoms were somewhat atypical, consisting of 10 days fever with cutaneous eruptions and pains in various parts of the body. The patient rapidly recovered under treatment with neosalvarsan. *E. H.*

TROPICAL OPHTHALMOLOGY.

A REVIEW OF RECENT ARTICLES XXII *

Trachoma.—WALL¹ has drawn attention to the disease as it occurs amongst the Canadian Indians. The central and southern prairie areas and the eastern and central parts of British Columbia are the districts chiefly affected, and it is likely that the disease has been present in them for a very long time though it may have been introduced by the earlier white settlers. Changes in the habits of the people, who formerly led a healthy outdoor life but now live in badly ventilated and overcrowded huts, have increased their liability to contract the disease. Infection is mostly familial. The more elderly females wear a scarf as a head-dress and use its loose ends to wipe the eyes, nose, and cheeks of both healthy and diseased members of their family and thus freely disseminate infection. Scrofulous children are the most difficult to cure. The disease is aggravated by the dust and sandstorms met with in these dry, hot districts. Diet does not appear to influence the condition to any great extent. Education of the rising generation to co-operate in preventive hygienic measures affords the most hopeful means of eradicating the disease.

FERNANDO² has issued a timely warning against the hasty diagnosis of trachoma with respect to the population of the Philippines. He considers that true trachoma is really very rare in the islands and that the majority of the cases diagnosed as trachomatous are merely folliculosis. The inhabitants in fact appear to possess a relative immunity to the disease. Injury may result from operative interference undertaken by inexperienced medical men and nurses.

RICE, DRAKE & SMITH³ have given STASTNIK's treatment (of copper sulphate and sodium thiosulphate, used locally and intravenously) a fair trial and failed to observe any marked beneficial effect. Large doses appeared to exercise a slight influence upon the disease, but they produced an undesirable reduction in red blood cells and haemoglobin. The authors conclude that the possible dangers of the treatment outweigh any slight benefit it may induce and it does not compare favourably with the ordinary methods. RUATA⁴ advocates treatment by a vaccine called "Lacmine" prepared by him. He thinks the disease is caused by some constitutional factor acting in combination with a superimposed infection. True cicatrizing trachoma does not occur unless both factors are present in the individual. Lymphatism and acidosis together with endocrine and gastro-intestinal defects are important elements. His vaccine treatment has yielded excellent results in some of the Italian Government camps for Bedouins. The

* For the twenty-first of this series see Vol. 31, pp. 401-408.

¹ WALL (J. J.) Trachoma in the Indians of Western Canada.—*Brit. Jl. Ophthalm.* 1934. Sept. Vol. 18. No. 9 pp. 524-532.

² FERNANDO (Antonio S.). Some Remarks on Trachoma among Filipinos.—*Jl. Philippine Islands Med Assoc.* 1934. Apr. Vol. 14. No. 4, pp. 137-141.

³ RICE (C. E.), DRAKE (A. A.) & SMITH (J. E.). Intravenous Use of Copper Sulphate combined with Sodium Thiosulphate in Treatment of Trachoma.—*Public Health Rep* 1934 May 4. Vol. 49. No. 18 pp. 555-559.

⁴ RUATA (V.). Two Years of Experience of Vaccine-Therapy in Trachoma and Ocular Infections.—*Jl. Egyptian Med. Assoc.* 1934 Feb. Vol. 17. No. 2 pp. 137-155.

camp inmates were particularly favourably placed with respect to their hygienic and general conditions. Lacrimine is said to strengthen general resistance and not to be specific for trachoma. Acidosis is met by the hypodermic administration of a compound of sodium and potassium citrate called "Endoneutralio". WILSON⁵ commenting on Ruata's paper, however, considers that the treatment is based upon false premises and states that it has been quite unsuccessful in his hands.

In the *Revue Internationale du Trachome* for April 1934, F. MOTAIS⁶ advocates tarsal excision in the treatment of the late stages of the disease. He removes the tarsal plate through the skin surface of the lid, making an incision similar to that used in Streatfield's operation for entropion. The tarsus is shaved away until the conjunctiva is reached and care is taken not to injure that membrane. The removal of the diseased glands situated in the tarsus is wholly beneficial, and the author suggests that a study of the bacteriology and pathology of these glands might prove just as profitable as that of the trachomatous conjunctiva and follicles. ENRIQUE SELFA⁷ recommends intravenous injections of citrate of copper. The injections lower the activity of heart and unstriated muscle and thus induce a fall in blood-pressure; consequently only those patients whose circulatory and digestive systems are healthy should be subjected to the treatment. Eight centigrams of the salt are injected and the dose may be repeated after an interval of three days. MARCELL FALTA⁸ contributes a useful article on the disease. He remarks how difficult is it to be sure that any two observers are discussing precisely the same disease when they refer to trachoma. He believes there is no such thing as acute trachoma, but an acute inflammation, due to a secondary infection, may attack a trachomatous eye. He attaches much importance to ptosis as being an indication of early trachoma. The disease should be classified as mild or severe rather than early or late; it may assume a severe form even in its earliest stage. L. POLEFF⁹ discusses the preventive measures to be adopted amongst backward and mixed communities. Prophylaxis demands a government organization and must be adapted to suit the peculiar circumstances of the affected population. Special attention should be directed to the vicious circle between family and school infection.

In the issue for July 1934, MULLER¹⁰ reviews the climatic conditions which favour the spread of the disease. Briefly these prevail in the subtropical regions where the temperature in the coldest weather does not fall below 4°C., and the humidity and rainfall are comparatively

⁵ WILSON. Discussion on Dr RUATA's Paper.—*Jl. Egyptian Med Assoc.* 1934. Feb. Vol. 17. No. 2 pp. 156-157.

⁶ MOTAIS (F.). Des effets favorables de la tarsectomie par voie cutanée pour améliorer et calmer les lésions du trachome avec ou sans entropion.—*Rev. Internat. du Trachome.* 1934. Apr. Vol. 11. No. 2. pp. 65-84. With 7 figs.

⁷ SELFA (Enrique). Le citrate de cuivre dans la thérapeutique du trachome.—*Rev. Internat. du Trachome* 1934. Apr. Vol. 11. No. 2. pp. 84-92.

⁸ FALTA (Marcell). De l'unité dans quelques questions du trachome.—*Rev. Internat. du Trachome.* 1934. Apr. Vol. 11. No. 2. pp. 92-99.

⁹ POLEFF (L.). Quelques particularités de la lutte contre le trachome dans les pays avec une population mixte.—*Rev. Internat. du Trachome* 1934. Apr. Vol. 11. No. 2. pp. 99-108.

¹⁰ MULLER (A. R.). Le rôle du climat dans l'étiologie du trachome.—*Rev. Internat. du Trachome.* 1934. July Vol. 11. No. 3. pp. 147-158. With 1 map.

low. EMANUELE GALANTE¹¹ describes the bio-microscopic appearance of the limbus in health and in trachoma. Normally three zones of limbic vessels are seen: (1) the palisade zone, (1) the zone of marginal loops, and (3) the zone of end capillary loops which are empty. A primary groove separates the border of the palisade zone from the sclera and a shallow secondary groove lies between the marginal loops and the zone of end capillaries. In trachoma an excessive development of end capillary loops takes place whilst an oedema masks the grooves and causes haloes round the vessels.

Glaucoma.—The disease as it concerns the General Practitioner has been dealt with by ELLIOT¹². His paper presents all the essential features of the disease in a manner most simple though very comprehensive. The author emphasizes the fact that eyes below the normal size are particularly liable to contract glaucoma, and states that he measures very carefully the corneal diameter of any patient who has a family history of the disease as he considers the hopefulness of the prognosis is in direct proportion to the size of the diameter.

Cataract.—KIRBY & WIENER¹³ have contributed a useful review of the various factors likely to influence the occurrence of senile cataract. The authors conclude that it is difficult to limit the aetiology to any one factor or to a group of factors and are disposed to regard the disease as "a genetically induced change in the structural configuration of the lens protein molecule which makes it susceptible to the physical and chemical phenomena concerned in the production of cataract". DAY¹⁴ reports investigations which indicate that it is possible to induce cataract formation in various animals (rats, mice, monkeys and chicks) by deprivation of vitamin G or B2. Numerous observers have previously noted in rats deprived of G the occurrence of dermatitis and loss of hair as well as ophthalmia, and their failure to notice the onset of cataract may be due to the gumming of the lids which obscures the lens changes. Cataract formation is prevented by the administration of yeast, autoclaved yeast, liver, kidney, and other foods containing vitamin G. This particular vitamin is stable to autoclaving and is soluble in water and in dilute alcohol, but is insoluble in strong alcohol. The lens change is sufficiently constant to render an ophthalmoscope an important laboratory instrument by which the earliest sign of vitamin G deprivation changes may be detected. UBALDO & AYUYAO¹⁵ describe a technique of intracapsular extraction which they have employed on 394 eyes with very satisfactory results. They use a bridge-flap and extract the lens with a vectis introduced behind the lens from the temporal side. The authors state that posterior synechiae are present in most of their cases and they free the iris with a

¹¹ GALANTE (Emanuele). Studio biomicroscopico della regione limbare dell'occhio di soggetti tracomatosi.—*Rev Internat du Trachome*. 1934. July Vol. 11. No. 3. pp. 129-147. With 3 coloured figs on 1 plate [33 refs.] English summary

¹² ELLIOT (R. H.). Glaucoma.—*Post Graduate Med. Jl*. 1934. Sept. Vol. 10. No. 107. pp. 323-333. With 5 figs.

¹³ KIRBY (Daniel B.) & WIENER (Renée v E.). Senile Cataract. A Study of the Biology and Chemistry of the Crystalline Lens.—*Brit Jl Ophthalm*. 1934. July. Vol. 18. No. 7. pp. 388-403 [25 refs.]

¹⁴ DAY (Paul L.). Vitamin G Deficiency.—*Amer Jl. Pub. Health*. 1934. June. Vol. 24. No. 6. Pt. 1. pp. 603-608. With 3 figs. [16 refs.]

¹⁵ UBALDO (A. R.) & AYUYAO (C. D.). Intracapsular Extraction of Senile Cataract with Conjunctival Bridge.—*Jl. Philippine Islands Med Assoc*. 1934. June. Vol. 14. No. 6. pp. 215-217.

spatula before introducing the loop Vitreous prolapse occurred in only seven of their cases.

Leprosy.—MUIR & CHATTERJI¹⁶ strongly advocate subconjunctival injections of trypan blue in the ocular lesions of leprosy. A solution of 0.1 per cent in normal saline is injected subconjunctivally. Repeated injections are made at suitable intervals.

Trypanosomiasis.—VAN DEN BRANDEN & APPELMANS¹⁷ have endeavoured to determine the causes of the optic atrophy which sometimes unfortunately results from the disease or its treatment. Of 118 patients treated with tryparsamide twenty per cent. developed visual defects. Those whose cerebrospinal fluid showed pathological change were specially liable to contract ocular complications. The authors attribute the optic nerve changes to a combination of factors. These are (1) changes in the nervous system, especially the meninges, induced by the disease, (2) the toxic action of tryparsamide, and (3) the endotoxins liberated by massive doses of the drug. Loss of vision due to atoxyl treatment is usually progressive even when treatment is stopped whereas that associated with tryparsamide may sometimes be arrested when the drug is withdrawn. Early diagnosis of the infection, so that the endotoxins liberated when treatment is instituted may be limited in amount, and a constant, careful watch for a diminution of visual acuity and visual fields are the measures most likely to prevent the occurrence of optic atrophy.

Boutonneuse fever.—ANDREOLI & CHARLET¹⁸ have studied the ocular complications of this disease. Naturally the eye troubles are most evident when the conjunctiva is the site of inoculation, and a condition closely resembling or identical with Parinaud's conjunctivitis then results. Very marked chemosis with non-suppurative ulceration of the conjunctiva and swelling of the pre-auricular gland occurs three days after the inoculation. Constitutional symptoms set in and the patient develops a typical boutonneuse fever. The conjunctival inflammation is limited to one eye and lasts for a variable time though it may clear in a week. The cornea remains clear throughout. A mild conjunctivitis may occur during the ordinary course of the fever. This is associated with the formation of reddish nodules on the bulbar conjunctiva and some photophobia is the chief symptom of the trouble. Iritis sometimes results from the general infection.

Syphilis.—CUENOD & NATAF¹⁹ have reviewed very fully the influence of syphilis upon the causation of diseases of the eye in North Africa. The population is very heavily infected and the ordinary syphilitic diseases of the eye are common though the ocular complications of cerebro-spinal syphilis are remarkably rare. One of the features of ophthalmology in North Africa is that any ordinary disease of the eye such as trachoma may be greatly influenced by the co-existence of a syphilitic infection; e.g., trachoma may precipitate an attack of interstitial keratitis. It is stated that an atrophy of the optic nerve may

¹⁶ MUIR (E.) & CHATTERJI (S. P.) Trypan Blue in the Treatment of Leprous Eye Lesions.—*Leprosy in India*. 1934 Jan Vol. 6. No. 1. pp 9-11.

¹⁷ VAN DEN BRANDEN (F.) & APPELMANS (M.) Les troubles visuels dans la trypanosomiase humaine.—*Ann Soc Belge de Méd Trop* 1934 Mar 31 Vol. 14 No 1 pp 91-107. [20 refs.]

¹⁸ ANDRÉOLI & CHARLET Fièvre boutonneuse et troubles oculaires.—*Bull Acad Méd* 1934. Mar 6 98th Year. 3rd Ser Vol 111. No 9 pp 338-347.

¹⁹ CUENOD & NATAF (Roger). La syphilis oculaire en Tunisie.—*Tunis Méd.* 1934. July-Aug. Vol. 28 No. 7. pp 415-485 [9 pages of refs.]

often be provoked by an attack of malaria or severe typhoid fever if the patient is a syphilitic. It is believed, too, that syphilis may be a cause of simple glaucoma.

Myiasis.—TRABUT²⁰ reports from Algeria a case of conjunctival infection by *Oestrus ovis*. The patient had been annoyed by a black fly which made persistent attempts to enter his ear. Shortly after he felt a blow on his eye and within twenty-four hours developed a catarrhal conjunctivitis with muco-purulent discharge and swollen lids. Small black specks were present in the discharge and these were identified by SERGENT as larval forms of *Oestrus ovis*.

Anaesthesia.—LYLE & FENTON²¹ recommend the intravenous use of *evipan* in eye operations when a general anaesthetic is required. The solution used is 1 gram of sodium *evipan* in 10 cc. of distilled water, and the dose varies from 4.5 cc. in the case of old toxic patients to a full 10 cc. in strong, healthy adults. A 10 cc syringe is used for the injection, and double the quantity of the fluid required to cause loss of consciousness (indicated by cessation of counting) is injected. A further small dose may be necessary if the above proves insufficient to produce relaxation and anaesthesia. The duration of anaesthesia is from fifteen to twenty-five minutes. Severe diseases of the liver or of the kidneys seem to be the only contra-indications. The intraocular pressure falls under *evipan* and this renders it especially suitable for cases of acute glaucoma. The only difficulty here is that the eyeball tends to roll up [This may be met by the insertion of a control suture through the superior rectus.]

The Twentieth Annual Report of the Ophthalmic Section of the Egyptian Government for the year 1932²² provides much interesting statistical information dealing as it does with nearly three-quarters of a million of new patients during the year. Thirty thousand of these suffered from gonorrhoeal ophthalmia and about seventy-five per cent. of the total from trachoma in some form. For entropion and trichiasis Snellen's operation was the one most favoured; it accounted for 59,974 operations out of a total of 242,365. Heisrath's combined excision accounted for 330; senile cataract for 1,518, and trephining for 1,145. The report shows how well the Government maintains its progressive policy of medical relief. The steady fall in the number of blind persons demonstrates how successful this policy has been. *H. Kirkpatrick*

²⁰ TRABUT (G.) Un nouveau cas de myiase oculaire à *Oestrus ovis*, à Alger — *Arch. Inst. Pasteur d'Algérie* 1933 Dec. Vol. 11 No 4 p 598

²¹ LYLE (T. Keith) & FENTON (F. G.). The Advantages of Intravenous (*Evipan*) Anaesthesia in Ophthalmic Surgery — *Brit Med J.* 1934. Sept 29. pp. 589-590

²² EGYPT Ministry of the Interior. Department of Public Health Ophthalmic Section. Twentieth Annual Report of the Ophthalmic Section, for 1932.—42 pp With 1 folding map & 1 chart. 1934. Cairo. [P.T. 10]

LEPROSY

LEPROSY REVIEW 1934. July. Vol. 5 No. 3. pp. 99-148.
With 6 figs. on 2 plates. Quarterly Publication of the British
Empire Leprosy Relief Association, 29 Dorset Square, London,
N.W.1.

This issue contains an interesting report for 1933 on the Ngomaharu Leprosy Hospital in Rhodesia by B. MOISER. After five years trial iodized and non-iodized ethyl esters of *Hydnocarpus wightiana* oil are being used exclusively in large doses up to 10 cc. intramuscularly, with or without a part intradermal. The preparation used is partly supplied by the Cape Town Government laboratory. He is clear that the results with modern treatment are now far better than he has seen in 25 years former experience. All cases should receive its benefits as some of the very worst have shown remarkable improvement, and eventually with prolonged treatment many are discharged as "apparently cured." A table of 722 treated cases shows 216, 30 per cent., thus discharged, 55 per cent. of whom were mixed or cutaneous cases. The same worker records a case of leprosy, complicated by syphilis, with great enlargement of the cervical glands from which acid-fast bacilli were discharged. JOSE RODRIGUEZ records his opinion that chaulmoogra preparations are of real value in the treatment of leprosy, but their indications and limitations require further study, and he once more points out that they do not appear to be as effective in "incipient" as in cases showing acid-fast-bacillus-containing lesions. G. R. RAO has tried ethyl esters prepared from "*Pongamia Glabra*," one of the oils advised in old Indian medical works together with *H. wightiana*. It had no effect on the acid-fast bacilli of the lesions, but produced intense hyperpigmentation, so may be of use in early cases or leucoderma, although it failed in advanced ones. L. Rogers.

LEPROSY IN INDIA 1934 July. Vol. 6. No. 3. pp. 127-171.
With 4 plates & 1 fig. Issued quarterly by the Indian Council of
the British Empire Leprosy Relief Association.

This number begins with an account of a promising extension of the survey-propaganda-treatment method of control by E. MUIR and K. R. CHATTERJI. In a village union in the highly infected Bankura district a committee was formed of the local doctors and a member of each village, a leper clinic was built and treatment carried out after a survey of all the houses except those of some recalcitrant Mussulman villages. A new feature was the voluntary isolation of the highly infective cases either in huts outside the village in accordance with ancient aboriginal custom, or in the case of the well-to-do within the compound of the house, but with the door leading exteriorly only. In the survey 53 infectious and 92 non-infectious cases were found in the Hindu villages, and 16 out of the 19 highly infectious ones among poor people were thus isolated, and out of 221 known cases of leprosy 155 are attending regularly for treatment.

S. N. CHATTERJI reports on the decapsulation of thickened nerves, such as the ulnar and peroneal, with some improvement in sensation within about three days, but the later results are not noted. B. N. GHOSH records that an examination of 1,573 beggars in three of the divisions of Calcutta revealed 152 lepers, of whom 57 were cutaneous and 95 neural cases, doubtless mostly harmless old ones. E. MUIR

reports on the relative painlessness of iodized and uniodized esters, and he concludes that the Philippine esters are rendered less painful by the addition of half per cent. iodine, but the Calcutta esters, made without distillation, are still less irritating. Reprinted reports include that of G. A. RYRIE on leprosy work in the Malay States for 1933, which records that the injection of dyes does not give lasting results, although temporary benefit follows 20 cc doses of a 2 per cent. solution of fluorescein twice weekly in half the cases. He also notes that although universal compulsory segregation is still the legal method of dealing with leprosy, yet an out-patient clinic for ambulatory patients has become increasingly popular and the number of cases discharged after three monthly negative clinical and bacteriological examinations has increased to 151 from 91 in 1932.

L. R.

LICHTWARDT (Hartman A.). **Leprosy in Afghanistan. A Preliminary Statement.**—*Internat. Jl. Leprosy*. Manila. 1934. Jan.-Mar. Vol. 2. No. 1. pp. 75-76.

In this brief note on thirteen years' experience at the Meshed mission hospital, Persia, it is recorded that among 200 lepers from Afghanistan all but one were in the Berberi people of Mongolian extraction, probably owing to decreased racial resistance, as the same race also suffers most in Persia. The cases are mostly advanced, but an increasing number of early cases are seen and looked after in a local voluntary leprosarium.

L. R.

RYRIE (Gordon A.). **Leprosy in Malaya.**—*Internat. Jl. Leprosy*. Manila. 1934. Jan.-Mar. Vol. 2. No. 1. pp. 77-80.

A brief account of the well-known compulsory segregation efforts to deal with leprosy in Malaya. The author thinks that under the law requiring every leper to be isolated the majority of the obvious lepers, whom he estimates at 0.1 per mille, are segregated either in the Penang Island settlement with 700 to 800 cases, or in the modern Kuala Lumpur one with about 1,000.

L. R.

LAMPE (P. H. J.). Voordrachten over de endemiologie der lepra. [**Endemiology of Leprosy.**]—*Geneesk Tijdschr. v. Nederl.-Indië*. 1934. Apr. 10 & 24. Vol. 74. Nos 8 & 9. pp. 486-496, 522-525. With 3 graphs. English summaries.

The author emphasizes the great prevalence of leprosy in youth, with the occurrence of latent or spontaneously recovering infections and the arrest and retrogression of others. He thinks that natural resistance is not the only explanation, but that lowered resistance due to intercurrent diseases, bad conditions of life and diet deficient in vitamin A, especially in children, predispose to the disease.

In a further paper he stresses the importance of gaining the patients' confidence by avoiding all compulsion, but employing educational and treatment methods and examining all school children for leprosy.

L. R.

SOETOMO & SOETOPO. Bijdrage tot rationeeler bestrijding der lepra. [Rational Control of Leprosy.]—*Geneesk. Tijdschr. v. Nederl.-Indië*. 1934. May 8. Vol. 74. No. 10. pp. 606-616 [24 refs.] English summary.

These authors also lay stress on the great frequency and importance of leprosy infections during childhood and youth, often contracted by contact with adult cases, but spread among the children plays the most important part, and this fact should be the basis of control measures if they are to have the best prospects of success. L. R.

RODRIGUEZ (J) & PLANTILLA (F C.). *Leprosy in Cebu*. II.—*Philippine Jl. Sci.* 1934. Jan Vol. 53. No. 1 pp. 1-46.

The economic, hygienic and social conditions of 1,313 persons living in houses containing a leper, and of 1,817 controls have been noted in a selected poor area by house-to-house inquiries.

In the leper houses the mean ages of both sexes was higher, as were the illiteracy and the mortality with more overcrowding, less vegetation around them, dirtier habits and larger families. The diet in the leper houses included more rice and raw shellfish but less vegetables and fresh fish. Forty-seven per cent of the bacteriologically positive lepers were under twenty years of age when the diagnosis was made, as were 57 per cent. of the "closed" or incipient cases. In 80 per cent. of the positives previous contact with a leper was noted, and 44 per cent. had lived in the same house with one; among the closed cases the corresponding figures were 68 and 3 per cent. L R

LOWE (John). *The Sex Incidence of Leprosy*.—*Internat. Jl Leprosy*. Manila. 1934. Jan.-Mar. Vol. 2. No 1 pp. 57-72 With 1 fig. [34 refs.]

This paper gives a good account of the literature of the subject and includes the author's experience in India. It is illustrated by a curve which brings out the very similar incidence of the disease in the two sexes during the first fifteen years of life. It shows a slightly higher rate in females at the time of puberty due to the strain of commencing sexual life, and the well-known much higher male incidence in subsequent decades after the age of twenty-five, partly due to greater promiscuity and exposure to infection. He thinks that physiological and environmental influences play their part, and he suggests that important sources of infection outside the home and family life must be operative, as in nearly all leprosy endemic areas male sufferers are about double the females, although in some countries with few cases the females are said to exceed the males. Certain resemblances between the sex incidence of tuberculosis and leprosy suggest similar predisposing factors. L. R.

WADE (H. W.). *Tuberculoid Changes in Leprosy*. I. *The Pathology of Tuberculoid Leprosy in South Africa*.—*Internat. Jl. Leprosy*. Manila. 1934. Jan.-Mar. Vol. 2, No. 1. pp. 7-38. With 52 figs. on 10 plates. [30 refs.]

This paper is a more detailed account of the naked eye and microscopical appearances of the tuberculoid cases of leprosy previously

described by the author as common in S. Africa [this *Bulletin*, Vol. 29, p. 847] It is well illustrated by excellent photos of the skin lesions and drawings of sections, these bring out well the characteristic granular surface and linear lesions and show the giant cells, but very few lepra bacilli. The lesions often undergo complete resolution rendering this form of leprosy a mild one amenable to treatment. The paper should be read in the original by those interested. *L. R.*

CHIYUTO (Sulpicio). **Clinical Relation of the Early Macules in Children of Lepers and the Leprotic Skin Lesions in Positive Lepers.**—*Monthly Bull. Bureau of Health*. Manila 1933. Oct. Vol. 13. No. 10. pp. 349–357.

This study deals with the same cases as were reported in a previous paper [*ante*, p. 5]. An analysis of the distribution of the early lesions shows that they were always present on the head and neck, but much less frequent on the hand than in positive lepers, but on the whole they are a replica of the skin lesions in active cases. *L. R.*

MARCHOUX (E.). Un cas d'inoculation accidentelle du bacille de Hansen en pays non lepreux. [Case of Accidental Inoculation of Leprosy.]—*Internat. J. Leprosy*. Manila. 1934 Jan–Mar Vol. 2. No 1 pp 1–6 With 2 figs. on 1 plate.

A medical assistant was pricked in a finger by a needle during the removal of a leproma and the wound was injected with a little tincture of iodine after squeezing out blood from it. Nevertheless eight years after he developed a lesion containing acid-fast bacilli at the site of the wound at a time when he was in very bad health with septicaemia, from which he died soon after; this favoured the development of the infection. *L. R.*

JORDAN (Paul). Befunde bei Lepra. I.–III: Gleiche Hautveränderung bei Vater und Sohn. "Positive" Blutkultur Antigen im Urin. [Findings in Leprosy.]—*Arch. f. Dermat. u. Syph* 1934. July 22. Vol. 170. No. 3. pp. 365–377. With 1 fig [35 refs.]

In the first part of this paper a case is described and illustrated showing similarly distributed depigmentation and sensibility changes in father and son. In the second part the growth of yellow colonies of acid-fast bacilli in cultures from the blood during a leprosy reaction is reported, and the third part is the record of finding a complement deviating substance in an alcoholic extract of the urine of a leper.

L. R.

MANALANG (C.). **Pathologic and Bacteriologic Survey of Lepers (Post Mortem).** I.—*Monthly Bull. Bureau of Health*. Manila. 1933. Dec. Vol. 13. No. 12. pp. 411–413.

In this short note the author records that he made microscopical examinations of the skin of the hands of 19 lepers post mortem and he succeeded in demonstrating acid-fast bacilli in 13 of them, although none had shown definite leprosy lesions in this area during life. *L. R.*

MORTOATMADJO (Boentaran). De dikke-druppelmethode bij lepra-onderzoek. [The Thick Drop Method in Leprosy.]—*Nederl. Tijdschr. v. Geneesk.* 1934. June 23. Vol. 78. No. 25. pp. 2866-2876. English summary

The author agrees with the conclusions of other recent workers that acid-fast bacilli found in thick drops of blood are no evidence of blood infection as they may be derived from the skin during puncture; the method generally gives negative results in nerve leprosy L. R.

DES ESSARTS (J Quérangal) & LEFROU (G.). Contribution à l'étude histologique des lésions maculo-anesthésiques de la lèpre. [Histology of Maculo-Anesthetic Leprosy.]—*Bull. Soc. Path. Exot.* 1934 Apr. 11. Vol. 27. No. 4. pp. 311-318 With 2 figs.

The authors found that the microscopical examination of the skin in early maculo-anaesthetic leprosy shows characteristic changes consisting of disappearance of the papillary layer of the epidermis, which explains the loss of sensation, together with the development of clear vacuolated and vascular nodules formed of epitheloid cells with or without the presence of acid-fast bacilli; these they consider to be by themselves of diagnostic importance. L. R.

NATALI (Claudio). Reperti istologici e patogenesi delle seguenti alterazioni nella lepra. I. Alterazioni delle ghiandole a secrezione interna. II. Ganglioneurite solare leprosa (2 casi). III. Cancro e lepra. [Histological Changes in Leprosy.]—*Sperimentale*. 1934. Apr.-June Vol. 88. No. 2-3. pp. 251-324 With 21 figs [87 refs.] English summary.

This is a lengthy and well illustrated study of the histology of two cases of nerve leprosy in which, among other things, the microscopical appearances of lesions in the thyroid, suprarenals, testicles, islands of Langerhans, and the solar plexus are described. He concludes that destructive inflammatory changes and toxo-infective action of the endocrine glands play an important part in the pathology of leprosy.

L. R.

LEFROU (G) & BONNET (P). Les modifications de l'équilibre protéique du sérum sanguin comme élément de diagnostic précoce de la lèpre. [Changes in the Protein Equilibrium of Blood Serum and the Diagnosis of Leprosy.]—*Bull. Soc. Path. Exot.* 1934. Apr. 11 & May 9. Vol. 27. Nos 4 & 5. pp. 364-373; 491-500. [25 refs.]

— & —. Sur l'absence de relation entre la réaction de Vernes-résorcine et le déséquilibre protéique du sérum sanguin dans la lèpre.—*Ibid.* July 11. Vol. 27. No. 7. pp. 631-633.

CHORINE (V.) & PRUDHOMME (R.). Réponse à la note de MM. LEFROU et BONNET.—*Ibid.* pp. 633-634.

These workers in previous papers [*ante*, p. 552] found that in leprosy patients the total albumin is normal or increased, but the serum globulin is increased so that the ratio of serum albumin to serum globulin is reversed. In the first of these two papers they emphasize the diagnostic value of this blood change and consider the similar changes in other diseases possibly confused with leprosy. In febrile

states the increase in serum globulin is not usually seen, in pulmonary tuberculosis the total albumins are increased but not the globulin, in cancer they are both decreased, but in syphilis variable results are obtained. In the second paper they discuss the value of the Vernes-perethynol reaction, with the additional aid of which they hold that leprosy can be differentiated from syphilitic cases showing the same blood protein changes as leprosy, for in such cases the Vernes reaction for syphilis will be present. Illustrative cases of the value of the test are given. In the third paper Chorine and Prudhomme take exception to a statement by Lefrou and Bonnet. They point out that they have not done any work on leprosy or questioned Lefrou and Bonnet's findings. L R.

ANDERSON (H. H.), EMERSON (George) & LEAKE (C. D.) **A Pharmacological Evaluation of Certain Antileprotic Drugs.**—*Internat. Jl. Leprosy*. Manila. 1934. Jan.-Mar. Vol. 2. No. 1 pp. 39-55. With 3 figs. [21 refs.]

The authors hold that before any new drug is tried in the treatment of leprosy it should be tested in rat leprosy and by its action in inhibiting the growth in vitro of certain acid-fast organisms, including that of leprosy (which they believe they have cultivated) as well as by the toxicity of the preparation in animals. They record such tests in the case of the two most commonly employed chaulmoogra preparations, namely the ethyl esters and ROGERS' alepol consisting mainly of sodium hydnocarpate prepared from *H. wightiana* oil, and also of three new synthetic compounds, named No. 921 (sodium chaulmoogryl p-phenetidine sulphate), No. 923 (sodium di-hydro-chaulmoogryl p-phenetidine sulphate), and ADAMS' ethyl di-N-heptyl acetate, one of the best chemically and bacteriologically of many proposed antileprotic drugs he has prepared in the course of a number of years work. Rats were used for both toxicity and therapeutic trials and *in vitro* experiments were carried out on a supposed culture of *Mycobacterium leprae* with the help of Dr E. L. WALKER and Miss M. A. SWEENEY, who first showed the strong bactericidal effects of sodium hydnocarpate on acid-fast bacilli over a decade ago. The authors conclude from these important tests that the chaulmoogra ethyl esters and alepol are the most effective of the five preparations tried, and next came ethyl di-N-heptyl acetate, and last the two sulphates. L R

BOUSFIELD (Cyril E.). **Notes on the Treatment of Leprosy.**—*New England Jl. of Med.* 1934. May 24. Vol. 210. No. 21. pp. 1118-1120. With 2 figs.

This paper reports on the successful treatment of leprosy in a bandit-ridden part of China, where over 95 per cent. of early cases, just sufficiently advanced to allow of a certain diagnosis, are said to be curable, as are 95 per cent. moderately advanced ones recognizable at a glance and 75 per cent. of advanced cases, while the remaining incurable ones succumb to intercurrent diseases such as malaria and pneumonia. Great individual care and experience are required to enable such results to be obtained, especially in finding the optimum dose for each case. He found alepol intravenously "the least painful and generally the most effective of our whole armamentarium." It has, however, the great disadvantage of obliterating the veins in time, but

the ethyl esters intramuscularly, and especially by intradermal injection, are of great value. He also states that "the practise of the present government in China, in many places, of shooting all lepers, helps to aggravate their mental attitude" *L. R.*

ANDERSON (Hamilton H.), EMERSON (George A.) & FISHER (B. H.).
Acute Toxicity of Trypan Blue, Gentian Violet and Brilliant Green.
—Proc. Soc. Experim Biol. & Med 1934. Apr. Vol. 31.
 No. 7 pp. 825-828.

In view of the advocacy recently of the intravenous injection of certain aniline dyes to supplement the chaulmoogra treatment their toxicity has been tested on animals by the authors, who found that the intravenous dosage recommended by RYRIE and RYLES is within the possible lethal range as estimated by animal experiments, and they note that RYRIE admitted the occurrence of dangerous toxic effects in his patients. The intravenous toxicity of trypan blue especially varied in different animals, it depresses the central nervous system, and both brilliant green and gentian violet appear to be injurious to the liver. Moreover, in leprosy rats gentian violet and brilliant green are too toxic for continued administration, but trypan blue appears to be better tolerated and to have a higher leprocidal activity. *L. R.*

MONTEL (M. L. R.) Un nouveau traitement de la lèpre (Note préliminaire) [*Treatment of Leprosy by Intravenous Methylene Blue.*—*Bull. Soc. Méd.-Chirurg. Indochine* 1934. Feb Vol 12. No. 2. pp. 147-149

—, LE-VAN-PHUNG, TRUONG-VAN-QUE & NGUYEN-NGOC-NHUAN.
 2e note sur le traitement de la lèpre par les injections intraveineuses de bleu de méthylène.—*Ibid.* Mar. Vol 12. No 3 pp. 300-304

—, TRAN-VAN-HANH, NGUYEN-VAN-KHAI, LE-VAN-PHUNG, TRUONG-VAN-QUE & NGUYEN-NGOC-NHUAN. 3e note sur les injections intraveineuses de bleu de méthylène dans la lèpre: posologie, tolérance, technique.—*Ibid.* May. Vol. 12. No. 5. pp. 473-476

These three notes deal with successive stages of a trial of intravenous injections of 1 per cent. methylene blue in continuation of a former paper [*ante*, p. 548]. In the first of the present series Montel reports that the immediate effect of the injections is better than with any other treatment, resulting in reduction in the nodules and improvement in sensation accompanied by a sense of well being. The injections were given every other day in doses gradually increased from 15 to 40 cc., and five to eleven injections per case. In the second paper it is stated that prior to the injection of the dye 4 cc. of solution containing 1 gram of urotropine was injected to favour the permeability of the methylene blue, and notes of four treated cases are given, but the dose of the dye was limited to 30 cc. to reduce the reactions that may follow it, and he advocates the use of chaulmoogra treatment in addition. In the third note he deals further with dosage and tolerance of the drug on the basis of one hundred cases and records that no reaction followed the doses in 10 per cent., in 40 per cent. fever of one or two hours duration occurred and in the remaining 50 per cent. the temperature rose to 38.5° to 39.5°C.; the higher degrees are an indication for longer intervals between the doses. He now advises commencing with a dose of 5 cc.

of the 1 per cent. solution of methylene blue and to increase by 2 to 3 cc. at a time according to tolerance, the mean full dose being 20 and 30 cc the maximum. After 18 doses 15 to 20 days interval is allowed. The dye treatment combined with chaulmoogra preparations appears to increase the value of the latter. *L. R.*

BOUILLAT. L'huile de chaulmoogra, son rôle dans le traitement de la lèpre, sa fabrication à la pharmacie du gouvernement de Pondichéry. [**Chaulmoogra Oil in Leprosy: its Manufacture at Pondichery.**]*—Ann de Méd. et de Pharm Colon.* 1934. Jan.-Feb.-Mar Vol. 32 No. 1. pp. 17-46. [40 refs.]

This paper first gives an historical account of the discovery of trees in various parts of the world which furnish chaulmoogra, hydnocarpus and other oils containing chaulmoogric and hydnocarpic fatty acids used in the treatment of leprosy. The method of extraction of the oil from *H. wightiana* used in the French territory of Pondichery, India, is then described as by the use of cold expression from fresh ripe seeds, which have been successfully cultivated in Pondichery as elsewhere in warm humid climates. The oil is being supplied to other French territories in Africa and elsewhere, and an estimate is made that to allow of the treatment of lepers all over the world several hundred thousand tons of the seeds may be required. Fortunately Western India alone can supply very large quantities of the oil. *L. R.*

FENG (C. T.). **The Use of Benzylephedrine as an Analgesic in Chaulmoogra Injections.***—Chinese Med Jl.* 1934. June. Vol 48. No. 6. pp. 563-570. With 1 fig. [10 refs.]

After a reference to Johansen's formula of chaulmoogra oil 90 parts, olive oil 10 parts and benzocaine 3 parts to lessen the pain on intramuscular and subcutaneous injection, the author records that he prefers a mixture of chaulmoogra oil 800 cc, olive oil 200 cc. and benzylephedrine 1 gm., as the last named is readily soluble in oil and the amount required as an analgesic is only one-thirteenth of the quantity of benzocaine in the first formula. His mixture of the two oils is warmed on a water-bath to 60° to 80°C, filtered through paper while hot, one gram of pure crystals of benzylephedrine is dissolved in the warm filtrate, and the whole is heated in boiling water for one hour to sterilize it before it is put up in ampoules or bottles. The melting point is about 20°C, and if warmed to body heat it will pass through a medium sized needle. The author tried it on himself up to 9 cc. doses with only very temporary pain immediately after the injection, and he states that the tolerance to it is two or three times as great as after ordinary chaulmoogra preparations. *L. R.*

ARIZUMI (S.). **On the Potential Transmission of *B. leprae* by Certain Insects.***—Taiwan Igakkai Zasshi (Jl. Med. Assoc. Formosa).* 1934. Apr. Vol. 33. No. 4 (349). [In Japanese. English summary pp. 54-56.]

The author adds one more to the many investigations of the presence of acid-fast leprosy-like bacilli in insects in close contact with lepers. He found such bacilli, which he assumes to be *Myco leprae*, in the digestive track of flies, cockroaches, and more rarely in mosquitoes, either fed on lepers or caught in wards occupied by infective cases, but the

organisms tend to die out, although some may be passed in the faeces. He thinks the cockroaches by infecting food may be the most dangerous of those investigated. L. R.

LÉPINE (P.), MARKIANOS (J) & BILFINGER (F) Essais d'adaptation du bacille de Hansen à l'organisme du rat blanc [**Attempts to adapt the Leprosy Bacillus to White Rats.**].—*Bull. Soc. Path. Exot.* 1934. Apr 11 Vol. 27. No. 4. pp 373-384 With 3 figs.

In these experiments leprous tissue, both from nodules and thickened macules containing acid-fast bacilli, was injected intraperitoneally with finely powdered glass to diminish the resisting powers in white mice. Extensive lesions were produced in the abdomen with spread to the lymphatic system beyond that area, and the animals became emaciated and died in about two months with numerous acid-fast bacilli in the lesions including globi, indicating their multiplication in the animals. A series of five and six passages led to a great decrease in virulence with an increasing number of bacilli losing their acid-fastness and staining blue, which the authors consider a sign of degeneration. They then lost their power of inducing pathological or lethal changes in the rats, so the object of the investigators—to cause adaptation of the human organism to rats—failed of attainment. L. R.

SALLE (A. J). **Acid-fast Organism from Leprous Lesions. Cultivation in Tissue Cultures and Other Mediums.**—*Jl. Infect. Dis.* 1934 May-June. Vol. 54. No. 3. pp. 347-359 With 5 figs [25 refs]

The author summarizes his work thus:—

"Chick tissue cultures, prepared according to the method of Carrel, were used as culture medium for the isolation of the organisms of human and rat leprosy

"An acid-fast organism and a diphtheroid were isolated from four human nodules and one rat granuloma

"When transfers were made to artificial culture mediums (egg, potato, agar, etc) only the blue-staining diphtheroid multiplied

"After the primary isolations on chick tissue cultures, minced chick embryo medium furnished an excellent substrate for the cultivation of the organisms. As with chick tissue cultures, the minced embryo medium gave rise to acid-fast and nonacid-fast organisms

"A pure culture of the diphtheroid when inoculated into chick embryo medium gave acid-fast and nonacid-fast organisms.

"The diphtheroid and the acid-fast rods are apparently different phases of growth of the same organism.

"The organisms were acid-fast in tissues and nonacid-fast on laboratory mediums. The functional characteristics varied depending on the living condition of the tissues. In vigorous actively growing tissue the organisms were strongly acid-fast. As the tissue became less vigorous, the acid-fast property was less pronounced and, finally, as the tissue died, only nonacid-fast diphtheroids were seen.

"It is believed that human and rat leprosy are caused by one and the same organism." L. R.

DUVAL (C. W.) & HOLT (R. A.). **An Improved Method for in Vitro Cultivation of *B. leprae*.**—*Proc. Soc. Experim. Biol. & Med.* 1934. Apr. Vol. 31. No. 7. pp. 828-831.

The authors point out that concentration of the lepra bacillus in portions of nodules due to autolysing of the tissue cells in culture media

has been mistaken for multiplication of the organisms, which only increase as long as some tissue material remains. They therefore placed small pieces of sterile leprous tissue in 1 per cent. trypsin for 48 hours to autolyse the tissue to a butter-like consistence, and then spread it on the surface of an agar medium containing protein cleavage products, such as amino-acids, including tryptophane, cystine, tyrosine and leucine, together with sterile placenta autolysate or leucocyte extract and banana infusion with glycerine. They incubate at 37°C in paraffin closed tubes to prevent drying, and admit fresh air every 3 to 5 days. L R.

GOMES (J. M.) & ANTUNES (P. C. de Azevedo). **Complement Reaction in Leprosy. Activation by Potassium Iodide.**—Reprinted from *Rev. Biol. e Hig.* 1933. Dec Vol 4. No. 3 3 pp [Issued as Boletim No. 52 do Inst de Higiene, São Paulo.]

Formerly the authors had found that with the fat free bacillus of Deycke as an antigen in lepers a negative complement fixation reaction almost always became positive after the administration of two grams of KI daily for a week. They now report some evidence to indicate that the reverse is the case with latent infections of those in contact with lepers. L R

LOWE (John) **Studies in Rat Leprosy.**—*Indian Jl Med. Res* 1934. July. Vol. 22. No. 1 pp 187-198 With 8 figs. on 3 plates. [23 refs]

The distribution and microscopical characters of the lesions of rat leprosy are described and the previous literature reviewed

The author considers that the acid-fast bacilli of rat leprosy have not yet been successfully cultivated or generalized rat leprosy produced by their injection into those animals, and he found no evidence of the existence of a filterable virus, or of any direct action of sodium hydno-carpate on the bacillus in vitro. Rat leprosy differs from the human form in being much less limited to the skin, for it produces extensive nodular formation in the liver and spleen and much more generalized lesions of the internal organs. L. R

AFANADOR (A.) & BERNARD (P). **Evolution de la lèpre des rats après inoculations intraveineuses. [Development of Rat Leprosy after Intravenous Inoculation.]**—*C. R. Soc Biol.* 1934. Vol. 116. No. 27 pp. 1257-1259.

— Inoculation du bacille de Stéfansky dans les veines de rats bloqués.—*Ibid.* pp 1260-1261.

This note deals with the lesions produced by the intravenous injection of rats with acid-fast-bacillus-containing rat leprosy material in continuation of the work already reported by BERNARD [*ante*, p. 554]. The bacilli were present in the circulation at least 16 days after their injection either free or in the leucocytes of the blood. The lymphoid tissue was more involved than in natural infections, the liver showed many nodules developing in the portal spaces and containing acid-fast bacilli, and similar lesions were found in the muscle and under the endothelium of the heart, in the inter-alveolar spaces of the lung and in the thyroid and the suprarenal capsules. The skin was especially invaded and contained many bacilli. L. R.

ASAMI (Shuzo). Histopathologische Untersuchungen ueber Ratten lepra. [Histological Investigations in Rat Leprosy.]—*Mitt. u. Allgemeine Path u. Path Anat* 1934. Vol. 8. No. 2. pp. 269–282. With 4 coloured figs. on 2 plates

After reference to the work of STEFANSKY, DEAN and others the author reports having found 17 rats infected with leprosy out of 2,157 examined in Japan. He describes the naked eye and microscopical changes met with in both naturally infected animals and in those inoculated with acid-fast-bacillus-containing material from other rats. These are very similar to those found by other workers, namely general infection of the glands, including the mesenteric, and nodules in the internal organs, such as the spleen, liver and lungs and in the skin. The histological changes show the reticular system to be mainly involved in the pathological process, with the formation of large cells containing numbers of the causative bacillus

L. R.

LANDEIRO (Fausto). La réaction de Rubino-Marchoux chez les lépreux. [The Rubino-Marchoux Reaction in Lepers.]—*C R Soc. Biol* 1934. Vol 116. No 17 pp 174–176

This brief note records correct results by this test in 54 of 55 leprosy cases

L. R.

LEFROU (G) & BONNET (P.). La cholestérolémie chez les lépreux de la Guadeloupe. [Cholesteræmia in Guadeloupe Lepers.]—*Bull. Soc Path. Exot* 1934 July 11. Vol. 27. No 7. pp 627–630.

These workers have found cholesterol estimations in lepers to give such variable results that they have given up their study as having no practical value.

L. R.

WELCH (T B.). Some Considerations on Diagnosis in Leprosy and on the Treatment of Lepers.—*East African Med. Jl.* 1934. June Vol 11 No. 3 pp 76–83.

This is a brief general paper on the subject and contains nothing new. The importance of diet and the treatment of complicating diseases are emphasized.

L. R.

MONTEL (M. L. R.) La lèpre est-elle spontanément curable? Une observation de guérison spontanée? [Spontaneous Case of Leprosy.]—*Bull. Soc. Méd.-Chirurg Indochine.* 1934. Feb Vol 12 No. 2. pp. 156–161

— Un cas de lèpre revu après un intervalle de 33 ans —Guérison?—*Ibid.* Mar. Vol. 12. No. 3. pp. 292–297. [10 refs]

Two cases of nerve leprosy showing the well known tendency to cessation of active symptoms and long survival with stationary nerve damage.

L.R.

CHORINE (V), GUILLINY (R) & MONTESTRUC (E.). Inoculation de bacilles de Stéfansky dans la chambre antérieure de l'oeil du rat —*C R Soc. Biol.* 1934. Vol. 116. No 27. pp. 1261–1262.

GRILLO (J.) Sobre la seroterapia antileprosa y el cultivo del bacilo de Hansen —*Medicina Paises Cálidos* Madrid 1934. July. Vol. 7 No 7 pp 305–330. [160 refs]

- HANÓN (Julio L.). Anestesia segmentaria de origen leproso —*Semana Méd*
1934 Sept 6. Vol 41 No. 36 (2121) pp 674-680 With 3 figs
- MONTAÑES (P.). Proyecto de ficha para hacer el estudio epidemiológico establecer
la profilaxis en los casos de lepra —*Rev San e Hig Publica* 1934 Apr
Vol 9 No 4. pp. 320-324
- NOBL (G.) Juvenile tuberculose Lymphogranulomatose —*Wien Klin Woch*
1933 June 9 Vol 46 No 23 pp 717-719 With 2 figs
- PEYRI (Antonio) Epidemiología de la lepra en Cataluña —*Rev Méd Barcelona*
1934 July Vol 22 No 127 pp 8-18 With 5 figs
- RODRIGUEZ (J.), MABALAY (E) & TOLENTINO (J C) Gram Positive Forms of
the *M leprae* from Leprotic Lesions Bacteriologically Negative for Acid-Fast
Organisms: a Preliminary Report —*Monthly Bull Bureau of Health*
Manila 1933 Nov. Vol 13. No 11 pp 377-389
- SANTIAGO (Varela) A cruzada anti-anseniãna no Rio Grande do Norte (Seu
inicio e actuação durante o periodo de 28 de Março de 1926 a 4 de Outubro de
1930) —*Brasil-Médico* 1934 June 23 Vol 48 No 25 pp 479-486
With 11 figs
- VAAEMONDE FERNANDEZ (Joaquin) Estudio de una forma de lepra maculoan-
estesica poco frecuente en Galicia —*Medicina Paisés Cálidos* Madrid
1934 Apr. Vol 7 No 4 pp 174-176 With 2 figs
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PLAGUE.

BULLETIN DE L'OFFICE INTERNATIONAL D'HYGIÈNE PUBLIQUE. 1934. May. Vol. 26 No 5 pp. 830-884. With 4 maps (3 folding).—Enquête sur la peste en Afrique et sur le rôle des rongeurs sauvages et domestiques dans sa propagation—Union de l'Afrique du Sud, Congo Belge, Afrique Occidentale Française, Colonies Britanniques et Pays de Protectorat, Egypte, Tunisie, Algérie. [Questionary on Plague in Africa and on the Rôle of Wild and Domestic Rodents in its Propagation.]

A questionary is a useful document from which to ascertain what are subjects worthy of investigation and those worthy of consistent record. The questionary here set out, some of the answers to which are already forthcoming, relates to plague in Africa and to the rôle of wild and domestic rodents in its propagation. It is, in the main, as follows:—

I.—*Plague among wild rodents*—(a) Are there permanent signs of plague infection among wild rodents? Does it appear to be advancing or regressing? (b) Are measures for protection of towns, villages or isolated localities against infection considered possible? Have any of these (establishment of zones free from rodents, use of hydrocyanic gas) been adopted? What of new methods of destruction of rodents? (c) Has any new knowledge been gained relating to methods used to prevent the advance of wild rodents to natural frontiers (mountains, rivers, etc.)?

II.—*Human plague epidemic or endemic*—Transmitted in the ordinary way (infected domestic rats, fleas, etc.). (a) Is it increasing or decreasing? (b) Possibilities of an efficacious prophylaxis? (c) Possibilities of transport of the infection by merchandise, or as a result of trade between infected zones and sea ports or neighbouring countries? (d) Advantages and disadvantages of anti-plague vaccination?

III.—*Co-operation with neighbour-territories*—Has any opportunity occurred of special co-operation or of exchange of information with neighbouring territories in regard to any form of plague prophylaxis and, if so, what form?

IV.—*Position of the Principal Ports in regard to Plague Infection*—(a) Has the existence of rat plague been established in any port in 1932-33 and is it continuing? This is most important for ports in countries where plague prevails in the interior.

Replies are incorporated from Union of South Africa, Belgian Congo, French East Africa, Dakar, Nigeria, Gold Coast, British Somaliland, Nyasaland, Tanganyika, Egypt, Tunis and Algeria. In many of the reports details regarding plague measures or views regarding plague transmission are given as appendices. It is surprising, however, to find that the replies to this direct and detailed questionary are mainly of the type—"The answer is in the negative." In some cases a non-committal, indirect answer is given. It is interesting to note that the only country reporting permanent signs of plague infection among wild rodents is the Union of South Africa, but that it is without sign of any important extension. This country also uses with success, and systematically, poisons and gas in the burrows of wild rodents. In Tanganyika, however, hydrocyanic gas has not been successful against gerbils.

On the whole human plague everywhere seems to be regressing, or at least to be temporarily on the decrease

Tunis replies to the question regarding the possibilities of an efficacious prophylaxis that, "The importance of interhuman contagion has led the Public Health Service to define the routine procedure to be adopted for dealing with the propagation and dispersal of fleas. . . ." This has consisted in impregnation of the soil with a heavy gas and its treatment with tarry solutions. Temporary protection of individuals, especially of the plague personnel is obtained by the use of pyrethrine solutions. An atomizer is used for the application of the solution on approach to a case of plague

In Tunis also transmission of plague by merchandise or by trade is not discounted, as it is by most other countries. The merchandise which is most liable to act as carrier of plague fleas is the pressed bales of rags (chiffons) which are exported

Vaccination against plague is commended in some cases and not advocated in others. Tunis, again, has an interesting reply to this question. No antiplague vaccination has been done for two years as it is considered to be unreliable. Large scale vaccination, however, affords an opportunity of a survey and census of the population.

There is little of interest in reply to the questions on co-operation with neighbour territories or the position of the principal ports in regard to plague infection.

W. F. Harvey.

BOVÉ. Au sujet du rat à mamelles multiples (*Mastomys coucha*). [The Multimammate Rat.]—*Bull. Office Internat. d'Hyg. Publique*. 1934. May. Vol. 26. No. 5. pp 885-887.

One of the subjects of enquiry in the questionnaire of the Office International d'Hygiene Publique has reference to the rôle of certain wild rodents in the propagation of plague from one locality to another. A most interesting rodent in this connexion is what might be called the liaison rodent, half wild and half domestic, making contact at one end of its peregrinations with man and the animals around him and at the other with outlying country and truly wild animals. The multimammate rat is a type of such a rodent.

In South Africa in the towns it replaces the common mouse, lives on the remains of food and makes its nest in walls and under the ground of houses. At the same time it goes out into the fields to find other food or water. It uses the burrows deserted by gerbils for its few days absence from its village haunts and if plague gerbils have lived in these burrows the multimammate rat brings back infected fleas which it hands on to man. A communication from Senegal explains why this rodent is now called a rat instead of a mouse. It was called *Mus coucha* in 1836, then *Mus siliceus*, then *Mus microton* and recently *Mastomys coucha* by English authors. "As this animal is a rat and not a mouse it is more correct," says M. RODE, "to give it the generic name of *Epimys*, the designation for rats properly so called, since *Mus* is the designation appropriated to mice. It would become then *Epimys coucha* or white-nosed rat." Its mammae are numerous and it has at least 4 pectoral and 4 abdominal pairs ranging from the axilla to the inguinal fold. This rat is very prolific and, in Senegal, carried a minimum of 10 embryos.

W. F. H.

RODE (P.). Contribution à l'étude des mammifères vecteurs de la peste Détermination de quelques espèces. [**Mammalian Vectors of Plague. Determination of Some Species.**]—*Ann de Méd. et de Pharm Colon.* 1934. Apr–May–June. Vol 32. No. 2. pp. 268–272.

Body measurements, general characters and occasionally biological notes are given of the following mammalian vectors of plague:—*Xerus erythropus* (Syn. *Sciurus erythropus*, *Sc albivittatus*, *X leucombrinus*, *X conchicus*), *Arvicanthus rufinus* (Syn. *Mus rufinus*), *Epimys rattus* (*Mus rattus*) with its sub-species *Epimys rattus alexandrinus*, *Mastomys coucha* (Syn *Mus coucha*, *M silaceus*, *M. microdon*), *Mus musculus*.

The physical measurements given are:—length of head and body, length of tail, length of the posterior paw, length of the cranium, zygomatic width, post-orbital stricture and range of superior molars.

W. F. H.

BLUE (Rupert) **Bubonic Plague Control in California in 1903. Origin of Ratproofing as a Control Measure.**—*California & Western Med.* 1934. May. Vol. 40 No 5 pp. 363–365. [17 refs]

A historical account is given in this article of what might well be called the great San Francisco Anti plague Experiment of 1903.

The view that rats and transmission of plague were closely connected had no more than made its appearance at that time and the agency of the rat flea in the dissemination of plague was not yet known. It was therefore a bold step to take for the Federal health officer in San Francisco to decide "to throw the burden upon the rat and to base the campaign upon rodent eviction and eradication . . . Man was no longer to be held responsible for the crime." The survey made of the specially infected area showed a very insanitary condition of affairs. Whites and Chinese were living in this area in a state of overcrowding and in close association "with the Norway and other species of rodents." The rat was in possession of the field in a manner reminiscent of some Oriental cities. A series of three resolutions, which are quoted, was signed by Federal, State and City authorities and the Mercantile associations. The main tenor of these resolutions was rat destruction and a plan for rat-proofing of dwellings, the latter is probably the first record of this as a plague measure. By the agreement drawn up the work continued to February 1905, although "no plague infection in man or rodent had been observed for a period of fourteen months." It may be taken that the measures adopted had value, for no human cases of plague were notified in San Francisco up to the summer of 1907 which was one year after the fire and earthquake. Many of the refugees had been placed in cottages with no intervening spaces between the floor and the soil. This afforded excellent harbourage for rats and both epizootic and epidemic plague made their appearance. As a counter to this the cottages were raised 18 inches from the ground and cases ceased to occur. This method has been called rat-proofing by elevation. Other methods of rat-proofing involved the use of concrete substitution for wood on ground areas, retaining walls of concrete, the sealing of hollow walls from below and the use of wire screens of proper mesh over ventilators and low windows.

W. F. H.

KELLOGG (W. H.). **Plague.**—*California & Western Med.* 1934. Aug Vol. 41 No. 2 pp. 103-106.

A general account of plague is given which presents all its well known features. It is in the summary that the significance of present-day plague for California is emphasized. "Whether or not the pandemic is subsiding or only following the usual history of this disease no one can say. The certainties we have before us are that the disease is enzootic in California and that until governmental measures of extermination of the ground squirrels are prosecuted . . . we have an ever present menace in our midst." W. F. H

MEYER (K. F.) **Selvatic Plague—its Present Status in California.**—*California & Western Med* 1934. June. Vol. 40. No. 6 pp. 407-410. With 1 fig

Selvatic plague (JORGE. "Rongeurs et puces dans la conservation et la transmission de la peste." *Office Internat. d'Hyg Publ*, 1928, p. 36) is a term which is applied to that form of plague which spreads slowly from colony to colony among wild rodents, which has existed for centuries in Transbaikal and Mongolia in Asia and which, apparently, is even now establishing itself in other steppe-like or veldt-like countries. The origin of the present-day world-wide plague infection may possibly be traced to the Mongolian steppe and thence have given rise to its first real epidemic focus in Hong Kong (1894)

There seems little doubt that selvatic plague is definitely related to rat-plague and the original sequence may have been wild rodent to rat and then to man. There is evidence to-day of a reversal of the sequence and the establishment of a selvatic infection in South Africa, the Argentine and California. It is especially of the last of these foci that this article deals. There is a grave liability for this selvatic plague to "create large reservoirs of this pasteurellosis." Again a pronounced tendency of wild rodent plague is to the production of pneumonic plague in man. To this source the development of the Manchurian pneumonic epidemic of 1910 is ascribed, with its death roll of 60,000 and its 100 per cent mortality. Some of the experimental evidence would indicate that *Past. pestis*, "isolated from wild rodents, possesses a high virulence and a definite pneumotropism."

Californian selvatic plague, which is giving much concern to the authorities, has been established through contact with the ground squirrel (*Citellus beecheyi*). "Between 1903 and 1914 it has slowly but progressively invaded the coast counties south of the Sacramento River." Special investigation has been proceeding during 1933 and 1934 in the counties of California in which plague-infected squirrels have been discovered. The measures which are at present being taken to combat the prospective danger, are advice to ranchers and others of the danger attached to handling dead or sick squirrels and an active campaign—so far as funds allow—of poisoning by means of strychnine.

W. F. H.

GEORGE (P. V.) & WEBSTER (W. J.). **Plague Inquiry in the Cumbum Valley, South India.**—*Indian Jl. Med. Res.* 1934. July. Vol. 22. No. 1. pp. 77-104. With 1 map, 3 graphs & 2 plates. [19 refs.]

A restricted area, or a well defined population, may provide opportunities for the study of epidemiological theory. This is exemplified in the case of the Cumbum valley in South India, where

" climate, social conditions, rat susceptibility and specific flea population are all favourable to the spread of plague."

The observations of REYNAL and WASSILIEFF (*ante*, p. 35) that the recognition of plague infected carcasses is most satisfactorily obtained by examination of the bone-marrow was confirmed. In the Cumbum valley there is no well marked off-season for human plague, " house rat infestation is a marked feature of life in the villages, . . . and the *cheopis* index . . . is high all the year round." There was, however, a lowering of the *cheopis* index from March to August and also a lowering of human plague incidence each year, especially in April and May. The authors consider that sufficient emphasis has not been laid upon the conditions other than a high flea index necessary for the spread of plague. " The distinction between 'infected' and 'infective' fleas is significant. Fewer infected fleas become infective in hot dry weather, probably meaning that fewer become 'blocked.'" Transmission of plague by fleas which have become separated, as by death, from their rat host is obviously of epidemiological importance. In this way the rat-burrow with living fleas may remain infective. Some experiments under natural conditions have demonstrated that starved infected fleas can transmit "infection after at least 29 days starvation in rat burrows." It is inferred, therefore, that gaps between epidemics may be "bridged partly by starved infected fleas." Experiments on rat destruction by means of cyanogen gas were very interesting. The preparation used was "cyanogas" and "there is strongly suggestive evidence that fumigation was of great value in the prevention of plague." That, however, this conclusion may be premature and due to a chance occurrence is admitted by the authors, who point out that "even Cumbum village practically escaped in 1928. Cyanogas was not in use then." The authors are not sanguine on the subject of the eradication of plague infection from the Cumbum valley and conclude that "anything which deprives rats of food and shelter is an antiplague measure."

W. F. H.

- i. GIRARD (G.) & ESTRADÉ (F.). Faits nouveaux concernant la biologie de la *X. cheopis* et son rôle dans la persistance de l'endémopépidémie pesteuse en Emyrne. [New Biological Facts Relating to *X. cheopis* and its Rôle in the Persistence of Endemo-epidemic Plague Conditions in Emyrna.]—*Bull. Soc. Path. Exot.* 1934. May 9. Vol. 27. No. 5. pp. 456-458.
- ii. ESTRADÉ (F.). Technique et appareil pour la capture des puces dans les poussières et débris de céréales. [Technique and Apparatus for Capture of Fleas in the Dust of Cereals.]—*Ibid.* pp. 458-461. With 3 figs.
 - i. In Antananarivo *X. cheopis* is abundant, but it is quite exceptional to meet with it inside the houses of the inhabitants. There the fleas which attack the visitor, or which can be captured, are *P. irritans* or one of the *Ctenocephali*. It has long been a puzzle in Madagascar what could be the mechanism of human infection. The annual recrudescence of plague was hard to explain in the absence of any apparent epizootic or an enzootic and still harder of explanation often was the connexion between murine and human plague. Recent work, however, in Ceylon and in India, confirmed in Senegal, seems to give the clue to the mystery.

The authors proceeded to investigate whether the debris of the grinding of rice might not serve as a habitat of *X. cheopis*. In this

debris these fleas were found. This, and the other facts collected, left not the least doubt of the interest of the observations made for the epidemiology of plague on the high plateaux of Madagascar. Round the pestle and mortar, near the storage place of the "paddy," was an abundance of bran and ground particles of rice. In this material, when taken from particular places such as obscure corners, angles of the steps of stairs, the area of the rice granary, there was no difficulty in finding *X. cheopis*. In one highly infected canton with abundance of plague cases and abandoned villages *cheopis* were collected in three villages in lots of 14, 25 and 44. Each lot when ground up and injected into a mouse and a guineapig gave rise to plague. In one of these cases only a single bloated rat had been discovered 20 days before. Paradoxical as it may seem, it had been observed previously that *X. cheopis* could never be discovered in traps even in infected houses and it had been concluded that this flea was practically non-existent outside the burrow of its normal host the rat. The real facts have now come to light.

In the discussion which followed the remarks of M. CAZANOVE were very pertinent. Two points struck him, the one that *cheopis* had an elective affinity for the debris and the dust of cereals, the other that infected *cheopis* can survive between annual epidemics. He thought that in this way, perhaps, certain cases of plague of irregular appearance, explainable neither by human contagion nor by rat contagion, might find their solution in the action of the infected flea alone.

ii The apparatus which has been constructed for the capture of the elusive *X. cheopis* in rice-dust is of simple construction. It consists of a large container, a truncated cone, intended to contain water, fly-tox or alcohol. In the centre is a fixed plate with a central pin. The rest of the apparatus is built up of two parts, a funnel of hour-glass shape which fits closely over a receptacle with a 2 cm high surrounding wall. The whole apparatus is carried to the place of investigation and the test dust is rapidly filled into the upper mouth of the funnel. The funnel with its receptacle underneath, is placed in the large container and the central pin of the fixed plate in the latter engages with the receptacle of the funnel and thus the whole is centred. Fluid is or has been placed in position in the large container, the funnel is screwed off and removed and contact is thus established between the test dust and the fluid. As soon as this happens the dust fleas begin to jump and land in the fluid, where they are drowned and from which they can be gathered up for examination.

W. F. H.

JUDE (L. V. R.) & LUBET (J. V. H.). A propos d'une petite épidémie de peste à Beyrouth en 1932. Tentative d'une dératisation intensive. (Résultats.) [A Small Epidemic of Plague at Beirut in 1932. Intensive Rat Campaign Results.]—*Arch. Méd. et Pharm. Milit.* 1934. Feb. Vol. 100. No. 2. pp. 255-268.

How a small epidemic of plague at Beirut in 1932 was suppressed.

The French occupation of Syria has been followed by an enormous improvement in the sanitation of the towns of the country and of the standard of living generally. In this account of the measures adopted against plague in Beirut, a town of 200,000 inhabitants, there is a record of very determined effort. In 1920 there were 62 cases of plague and this number diminished progressively to one only in 1929. During 1930 and 1931 an increase occurred to figures of 28 and 20 respectively,

while in 1932, with a figure of 47 between April and November, it was evident that the current anti-plague methods were insufficient and that a new plan of campaign was required. The urgency of such measures was obvious if the commerce of the port and the tourist traffic were not to be affected. Quarantine regulations and sanitary measures were intensified. Vaccination was instituted on a large scale and 80,000 free inoculations were given. Something of the nature of a rat invasion was manifest at this time. One of the main anti-rat measures now begun was the use of "ratin," a Danysz virus, followed, if the total disappearance of rats did not occur in 3 weeks, by "ratinum," a Scilla poison which kills in 24 hours. The results—for it seems reasonable to call them so—of this costly activity, involving general deratization, vaccination and enforcement of sanitation was that only four human cases of plague occurred in 1933. These were sporadic and were not followed by any extension. Bacteriological examinations of captured rats now proved uniformly negative. W F H.

RAYBAUD (A) Les rats et la peste. [Rats and Plague.]—*Marseilles Méd* 1933 Dec 25 Vol 70. No. 36. pp. 723-732

The experience of thirty years of plague practice in Marseilles has convinced the author that the black rat and not the grey rat is to be feared as the transmitter of the disease to man and also that deratization measures need not be as extensive as is commonly recommended.

To begin with he affirms that the formula, rat-flea-man=plague, is not to be taken as absolute dogma, for he accepts the possibility of transmission from man to man without the rat intermediary. But most of the argument is concentrated upon the danger due to the black rat. This rat came to Europe from Asia Minor in the ships of the Crusaders. It was driven out of Europe again with the advent of the grey rat. This simple fact alone accounts for the disappearance of plague from Europe and not any sensational discovery, not any improvement in the methods of general prophylaxis, not any rise in the standard of living of European peoples. A consideration of the small epidemics of plague which have occurred in Marseilles since the beginning of this century, in 1903, 1919, 1920, 1925, and 1930 form subject matter for the development of the argument on the degree of utility of deratization measures. The epizootics related to these epidemics have shown little tendency to extension, thus showing that the supposed migratory tendencies of the town rats are something of a myth. In a town like Marseilles rats live and die in the same corner of store or cellar in which they are born. How far is deratization a necessary or a reasonable measure? asks the author. There is no question of its necessity for the rat of the ships. The ship rat is a black rat; it is the domestic rat, the rat which lives in companionship with human beings and, perhaps most important, it can be exterminated on board ship. On the other hand extermination of the rat on shore is impossible. Its essay may be regarded as desirable by the merchant, for the rat is a thief and a spoiler of merchandise. But that is an economic, not a sanitary matter, a matter for the capitalist and not the hygienist. San Francisco tried the experiment of extermination and spent \$9,000,000 before giving up this dream of perfection. It is futile to aim at perfection. A pair of rats, living on an average $2\frac{1}{2}$ years, and producing 8 young every three months would account in the end, with interbreeding, for the appearance of 2,621, 440 individuals, if it were not that the forces of nature come to our assistance to restrict

this scourge, Of what avail then in restriction are the few thousands of rats killed by deratization methods? This does not mean advocacy of abandonment, but only of the limitation of deratization methods and especially to the quarter where an epizootic focus shows itself.

Certain methods are recommended and others condemned. Rats should be captured alive with nets. Fleas leave the dead rat when cold and they are more dangerous than the living host animal. A system of careful surveillance of the rat population is recommended, with verification of the existence of infection through laboratory diagnosis. In this way a germinating focus of plague will be kept in check. Toxic baits and the use of virus are not recommended as they are apt to lead to death of the rat in its burrow. Any scheme of restricted deratization ought to involve measures to prevent the access of new rats to the places occupied by the old rats. Again insistence is made upon the fact that it is the black rat especially which, when found to be plague infected, is to be proceeded against. The black rat, dangerous as a domestic rat, is none the less a foreign rat. It may be brought to a town with merchandise and especially with merchandise that cannot be disinfested. An example of this is afforded by the trade in and entry of bananas.

In conclusion the author disclaims an attempt to negative the utility of deratization. He calls attention only to the need for discrimination in this regard, attention to the species of rat involved, the local conditions and in particular the undesirability that hygiene should confine itself to a blind acceptance of theoretical principles. *W. F. H*

REVUE DE MICROBIOLOGIE, D'ÉPIDÉMOLOGIE ET DE PARASITOLOGIE.
1934. Vol. 13. No. 1. pp. 3-88. [Papers on Plague and Other
Subjects.] [In Russian with German summaries.]

Several articles on plague are published in this number with short summaries of their contents in German.

Dr. M. POKROUSKAJA (p. 16) presents a description of what she regards as a true mutant of *Past. pestis* obtained by the action of bacteriophage on a plague culture. Its peculiarity lies in its want of virulence, for even a whole agar culture may be inoculated into the guineapig or the ziesel mouse without fatal result. Some attention is being directed at present to the use of living plague vaccine, which naturally must be non-pathogenic. This new culture should possess possibilities for such immunization and also for the production of high-value therapeutic sera.

Two articles by CHWOROSTUCHINA and GRIKUROW respectively (pp. 34 and 49) deal with serum reactions of plague sera. In the former the use of the precipitation or flocculation reaction is advocated for titration of anti-plague sera as being more sensitive than the agglutination reaction. An antigen for the test was obtained in the filtrate from a 6-month old bouillon culture, while the testing serum was furnished by a horse immunized with living plague bacilli. In the second article a research was conducted into the agglutinating properties of the serum in ziesel mice of plague enzootic districts. It is known that the plague virus can maintain itself in the ziesel mouse during the whole of an inter-epizootic period. The author has now shown that the sera of ziesel mice obtained from different districts showed specific agglutinins in a high proportion of samples, but that these were absent in the case of young animals. The titre of the reacting sera was high

at the end of the epizootic and diminished by the beginning of the summer of the following year. It is supposed that young ziesel mice with no protective substances in the blood may form susceptible material for fresh plague outbreaks.

Two articles have reference to the viability of the plague bacillus under conditions which have a bearing on the epidemiology of the disease. E. NOVIKOVA and G. LALAZAROW write on "The Preservation of Plague Virus in the Body of the Ziesel Mouse" (p. 54) and F. SEMIKOV and I. ACHOUROVA on "The Viability of the Plague Bacillus in Grain" (p. 60). Ziesel mice were inoculated with plague and on their death they were skinned, the gastro-intestinal canal removed and the bodies left exposed to sun and air. It was found that plague bacilli could be recovered from these bodies up to 23 days. The grain experiments were intended to afford data to show when infected grain stored in elevators could be safely exported. The infection was brought about by soiling the grain with blood, faeces, urine or the organs of plague mice. Periods of time of 1 to 8 days for one set of experiments and 12 to 27 days for another represented the viability of the plague bacillus.

Other articles deal with water bacteriology, scarlet fever toxin and anatoxin, influenza vaccination by inhalation, blood groups in the ziesel mouse, tularaemia and the helminthic fauna of the Kalmuck population.

W. F. H.

DE FIGUEIREDO (J. M. Pacheco) Relatório dos serviços executados na peste pneumónica em Nagoá e Raçaim. [**Measures adopted against Pneumonic Plague in Nagoa and Raçaim.**—*Arquivos da Escola Méd.-Cirurg. de Nova Goa*. Ser. B. 1933 No. 4 pp. 771-783.]

An individual disembarking in Nova Goa with bubonic plague and proceeding to his own home developed secondary bronchopneumonia from which cases of primary plague pneumonia followed. An account is given of the measures of disinfection adopted, the segregation of contacts into zones according to the degree of their contact and the administration prophylactically of anti-plague serum.

W. F. H.

ADVIER (M) & RIOU (M.) Bubon pesteux et lymphogranulomatose inguinale subaigue. [**Plague Bubo and Subacute Lymphogranuloma Inguinale.**—*Bull. Soc. Path. Exot.* 1934. Jan. 10. Vol. 27. No. 1. pp. 84-86. [Summary appears also in *Bulletin of Hygiene.*]

The authors draw attention to the possibility of certain cases of lymphogranuloma inguinale being mistaken for plague and mention eight such which they encountered in the last two outbreaks at Dakar. Conversely they saw four cases which they thought at first to be L.I. but proved to be plague. As clinical data may be inconclusive they recommend the application of all tests possible, the search for plague bacilli, the skin test of Ito-Rienstierna for chancroidal bubo and the skin test of Frei for lymphogranuloma inguinale. Naturally in case of doubt they would treat a case as one of plague pending further investigation.

L. W. Harrison.

ESTRADE (M. F.). Contribution à l'étude de l'action du bactériophage dans le traitement de la peste bubonique [**Bacteriophage in the Treatment of Bubonic Plague.**].—*Bull Soc Path. Exot.* 1934. June 13. Vol 27. No. 6. pp 609-611.

Some variation of treatment was adopted, thus giving a degree of control. The treatment ultimately preferred was to inject immediately one ampoule of bacteriophage into the bubo, follow with 40 cc. antiplague serum intravenously in the morning and another 40 cc the same evening. This bacteriophage-serum treatment was repeated on the following day, while in severe cases as much as 120 cc of serum was injected. A difference in results appears in the statistics, which is considered by the author to show that injection of phage into the bubo plus intravenous serum is the method of choice in bubonic plague. The figures were 5 cases of recovery out of 10 treated with serum alone intravenously, 3 out of 9 treated with phage and serum both intravenously, and 24 out of 30 treated with phage into the bubo and serum intravenously. It was found that fluid withdrawn from the bubo 24 hours after the second injection of phage was sterile. *W F H.*

GIRARD (G). Présence d'un principe lytique très actif vis-à-vis du bacille de Yersin isolé chez des rats de Tananarive. [**A very Active Lytic Principle to the Plague Bacillus isolated from Rats of Antananarivo.**].—*Bull Soc Path. Exot.* 1934. May 9. Vol 27. No. 5. p. 415. Also in *C. R. Soc. Biol.* 1934. Vol 115. No. 11 pp. 1219-1220.

Much vain search has been made already for the presence of anti-plague phage in the rats of Antananarivo. Some rats, however, were received in the laboratory with either cervical or inguinal suppurative adenitis. No plague bacilli could be found in these but in two of them a test for phage in intestinal and lymph node contents was set on foot which provided a very potent plague phage. Its activity was such that four strains of plague bacilli were lysed from the first passage and no secondary culture appeared. An idea is hazarded by the author that the presence of phage in the rats might explain the absence of plague in Antananarivo and particularly in the quarter from which the rats had come, which had been a focus for plague for ten years.

W. F. H

NAIDU (B. P. B.). Serum Therapy of Plague.—*Bombay Med. Jl.* 1933. Nov.-Dec. Vol. 2. Nos. 11 & 12. pp 302-305.

A plague-serum prepared at the Haffkine Institute of Bombay was found to give more satisfactory results, when tested on animals, than the similar sera of European institutes. The present article relates to the use of this serum in two human epidemics.

In the first epidemic, which was on the wane, there were 76 cases, 43 of which were treated with sheep serum and showed a mortality of 35 per cent. while 33 were alternate-case controls with a mortality of 69.7 per cent. The "alternate cases" were, at the later stages of the epidemic, made into every third case. In the second epidemic, which was at its height, there were 179 cases treated with a buffalo serum and a mortality of 60 per cent. to compare again with alternate-case controls, numbering 167, and a mortality of 85 per cent. The sera

were injected intravenously and had no deleterious effect even in doses of 100 cc. Thus the results obtained in both epidemics are distinctly encouraging.

W F H

BABLET (J.) & GIRARD (G) Lésions histologiques dans la peste pulmonaire primitive expérimentale du cobaye. [**Histological Lesions in Experimental Plague Pneumonia of the Guinea-pig.**]
Ann Inst. Pasteur. 1934 Feb Vol. 52. No. 2. pp 155-165.
With 4 figs.

It has been possible to produce, by the intratracheal injection of 500 million plague bacilli in 1/10 cc., a primary plague pneumonia in the guinea-pig.

A careful note has been made of the developing lesions. The first phase is the broncho-lymphatic, limited to the trachea, the larger bronchi and circumscribed small bronchopneumonic foci, which makes its appearance from the eighth hour after inoculation. By the commencement of the second day the second phase is entered upon and is characterized by numerous lobular foci of pneumonic reaction distributed around a central bronchiole. These foci steadily progress to suppuration, form abscesses, and are evacuated by the bronchi, but are still limited to the regional lymphatic system. A third and final phase concludes the picture. It is the short agonal stage with generalization of the lung condition and production of a bacillaemia. The abundance of plague bacilli at this stage in bronchi and trachea is exactly comparable to the condition in primary human plague pneumonia, where extreme infectivity is a feature of the disease at the approach of death. It seems justifiable for the authors to claim to have produced primary experimental plague pneumonia. They throw out a suggestion of the possibility of antiplague vaccination by intratracheal atomization of a suspension of attenuated living plague bacilli.

W. F. H

GIRARD (G) & ROBIC (J.). Vaccination contre la peste au moyen d'une souche de bacilles de Yersin, vivants, de virulence atténuée. [**Vaccination against Plague with Attenuated Living Bacilli.**]
Bull. Acad. Méd. 1934 June 26 98th Year. 3rd Ser Vol. 111. No. 24 pp 939-945.

There are many workers who maintain that vaccines if they are to be efficacious prophylactically should consist of living, although avirulent, organisms. A certain amount of hesitation in the use of such vaccines for human beings is only natural and therefore it is important that all trials of this sort should be placed on record. The authors have inoculated 15,000 persons in Madagascar with a living plague vaccine.

A large amount of animal experimentation preceded these trials, experimentation to prove the superiority of a living vaccine in immunization and the harmlessness of the procedure. Then came trials on the authors themselves, their staff and on volunteers. Finally the living vaccine from a plague strain "E.V." was used in villages where epidemic plague was prevalent. The results seem to have been notably successful for, while immunity from plague followed the use of the vaccine, the unvaccinated villages in the neighbourhood continued to be subject to the disease. No bad effects attended the inoculations either in children or in old people. The further progress of these trials will be awaited with interest.

W. F. H.

JOUKOW-WEREJNIKOW (N.) & LIPATOVA (T.). **Immunological Studies on Plague. I. The Comparative Value of Anti-Plague Sera in the Connection with the Study of the Significance of *B. pestis* Fractions in the Pathogenicity of Plague by Means of Schwartzman's Phenomenon.**—*Rev. Microbiol., Épidémiol. et Parasit.* 1933. Vol. 12 No. 4. pp. 257–266 [15 refs.] [In Russian English summary pp. 266–267.]

The authors have confirmed the finding that *Past. pestis* grown at 37°C., and best at pH 6.4–6.6, develops an envelope. This envelope may be isolated from the rest of the bacterial body by washing in a shaker, and demonstrated in the wash-water by a precipitin test. The antigens represented by envelope and soma respectively are different, as was shown by SCHÜTZE. Not only so but this soma is inagglutinable by the antiserum to LUSTIG's nucleoproteid, thus suggesting that the surface protein of the soma is not the same as the nucleoproteid, for the antiserum obtained by immunization with living whole bacilli agglutinates all three fractions of the bacillus.

The authors have also succeeded in obtaining Schwartzman's phenomenon (*Jl. of Exp. Med.*, 1928, Vol. 48) in rabbits "by means of the envelope culture of *B. pestis* emulsified in distilled water and lysed by subsequent freezing and thawing" The envelope substance, washed bodies of bacilli and nucleoproteid failed, when taken separately, to give the phenomenon. The bearing of these facts both upon the preparation of plague vaccines and of sera is probably well appreciated.

W. F. H.

SCHÜTZE (Harry). **The Envelope Antigen of *B. pestis* and its Antibody.**—*Brit. Jl. Experim. Path.* 1934. Aug. Vol. 15. No. 4. pp 200–206.

The importance of envelope antigen for immunization has been demonstrated. In the case of the plague bacillus it is only fully developed with growth at 34°C to 37°C. "It is a fragile structure, unstainable and easily dissolved . . . a large gelatinous mass . . . easily haptized at 100°C., 15 minutes at that temperature rendering it incapable of evoking precipitins in the rabbit or of immunizing rats against a lethal dose of living plague bacilli, though it is still capable of acting unimpaired as antigen *in vitro*, e.g. with a precipitating serum." In the present study with three anti-plague therapeutic sera it has been shown that the envelope substance is chiefly contained "in the pseudoglobulin fraction of buffalo serum and in the euglobulin fraction of sheep serum." When these therapeutic sera were inoculated subcutaneously and simultaneously with a dose of living *Past. pestis* into opposite flanks of a rat, it was shown that the protection afforded was correlated with envelope content of the antigen, as recorded by the precipitin test. This envelope antigen retains little power of producing antibodies in rabbits after heating for 30 minutes at 70°C. and is completely haptized at a temperature of 80°C. for 15 minutes. The antigen is also sensitive to alkalis and acids, being destroyed by N/8 sod. hydroxide acting for an hour at 60°C. and in 15 minutes by N/8 acetic acid at 100°C. "Plague vaccine . . . generally has a pH of over 8.0. Sterilization of the vaccine by heating to 56°C. at this reaction reduces its power of evoking precipitins in rabbits, but such

damage may be prevented by neutralizing the vaccine before sterilization. It is suggested that this sensitivity of envelope antigen to alkali may be of importance in the production of prophylactic anti-plague vaccines." W. F. H.

WRIGHT (Hedley D.). **The Cultivation of the Plague Bacillus.**—*Jl. Path. & Bact.* 1934 Sept. Vol. 39. No. 2. pp. 381-390. [10 refs.]

In his experiments on the conditions of optimum growth of the plague bacillus the author has found that this organism is relatively delicate, but that the fact is obscured in the ordinary methods of stock cultivation by the development of resistant forms. "The delicacy is revealed . . . by the fact that the bacillus may fail to grow from small inocula in a broth in which oxidization of the constituents has occurred on exposure to the air" and by its being readily destroyed by exposure in thin layers on an agar surface to the action of the air, particularly at 37°C." The first of these disabilities may be overcome by the addition of the requisite peptone to the nutrient medium at an early instead of a late stage in its preparation and the second if the oxygen content of the atmosphere be kept well above 1 per cent. or if serum (10 per cent.), blood (0.1 per cent.), or a reducing agent (0.05 per cent. sod. sulphite) be added to the culture medium. "Such media yield maximum growth aerobically at 37°C." W. F. H.

IYENGAR (M. O. T.). **Rat-Flea Survey of Peermade District, Travancore.**—*Indran Jl Med. Res.* 1934. Apr. Vol. 21. No. 4. pp. 723-730. With 1 map.

The paper describes a flea survey made near the southern end of the Western Ghats. It is a full and careful survey on familiar lines.

The great bulk of rats trapped were *R. rattus*, on which no less than nine species of flea were found to occur. Of these, *Xenopsylla cheopis* was the commonest, but *X. astha* and several other species were numerous. *X. cheopis* was present, and its index generally above 1 and frequently above 2, in the higher parts of the district. It was completely absent from the lower parts, and this difference in altitude clearly has a considerable effect upon the other species of flea. The spot map showing the presence and absence of *cheopis* would be of greater value if the contours were marked. P. A. Buxton.

HART (R. W.) & PELIKAN (E. R.). **Life Span of Fleas without a Host under Normal Atmospheric Conditions occurring in Manila.**—*Public Health Rep.* 1934. June 15. Vol. 49. No. 24. pp. 699-711.

The authors wished to discover whether fleas could reach Manila alive from Calcutta or Japan, assuming that the ships were completely free of rats on which they might feed.

They took a rather limited number of fleas belonging to four different species and exposed them to the climatic conditions prevailing at the time, giving them no opportunity of feeding. They present their results *in extenso* (10 tables), but they make no distinction between the species of fleas in the tables, nor do they distinguish the sex of the fleas, which is known to have an effect on their length of life. The authors appear to have read most of what has been previously published, but

their technique is less refined than that of any of their predecessors. They conclude that, under the climatic conditions likely to prevail, the life of the flea without a host would probably not exceed 5 days, but that if the humidity were very high, it might extend to 12 days. They appear not to have considered the possibility that the fleas on a rat-free ship might feed on other animals. *P. A. Buxton.*

WHITE (C. T.) Espèces et nombres de puces trouvées sur les rats, pris à terre, dans le port de Londres [*Species and Number of Fleas found on Rats on Land in the Port of London.*—*Bull. Office Internat. d'Hyg. Publique.* 1934. Feb. Vol. 26. No. 2. pp 255-257.

Seven hundred and twenty eight rats were examined, 497 *M. rattus* and 231 *M. norvegicus*, 242 rats harboured no fleas. There were collected in all 2,246 fleas, an average of 3.08 per rat. 1,862 (83 per cent) were *Ceratophyllus fasciatus*, 370 (16.5 per cent) were *Leptopsylla musculi*, 9 were *Ctenophthalmus agyrtes*, and 5 *Ctenocephalus felis*. The largest number of fleas found on a rat was 61, all were *C. fasciatus*. No single *X. cheopis* or *P. irritans* was found. The curve of prevalence of fleas followed closely that of average temperature. *A. G. B.*

ANTUNES (Alair Accioli) A luta contra a peste no Rio de Janeiro. Serviço de desratização—*Folha Méd.* 1934. Mar 25 & Apr 5. Vol 15. Nos 9 & 10. pp. 101-104, 110-115.

BODET (H.) Note au sujet d'un cas de mélaena chez un pesteux—*Bull. Soc. Path. Exot.* 1934. Mar 14. Vol 27. No 3. pp 286-288.

ESTRADE (F.) Résultats acquis après un an de fonctionnement d'un lazaret temporaire dans la circonscription médicale de l'Emyrne—*Bull. Soc. Path. Exot.* 1934. Mar 14. Vol 27. No 3. pp 288-289.

ESTRADE (F.) Conditions climatiques et peste en Emyrne—*Bull. Soc. Path. Exot.* 1934. Apr 11. Vol 27. No 4. pp 401-403.

HIROKI (H.) Plague Epidemic at Nungan in Kirin-Province, Manchoukuo in 1933—*Jl. Oriental Med.* 1934. Aug. Vol 21. No 2. pp 20-22.

LUGOWAJA (L.) & LEBEDEWA (E.) Ueber die Kernbildungen bei *B. pestis* und *B. pseudo-tuberculosis* rod. pfeifferi—*Giorn. di Batteriol. e Immunol.* 1934. June. Vol 12. No 6. pp 1073-1081. With 36 figs. English summary (2 lines).

JETTMAR (H. M.) Irrwege der Pestforschung—*Wien. Klin. Woch.* 1934. June 1. Vol 47. No 22. pp. 673-675. [17 refs.]

SAVINO (Enrique) La campaña antipestosa del Perú y Ecuador—*Semana Méd.* 1934. Mar 29. Vol. 41. No 13 (2098). pp 992-995.

CHOLERA

OFFICE INTERNATIONAL D'HYGIÈNE PUBLIQUE, PARIS. **Report of the Cholera Commission to the Permanent Committee of the Office International d'Hygiène Publique. Session, April-May 1934.** [M S. copy received from the Ministry of Health, London]

The Commission, according to this account, bases great hopes upon an enquiry to be conducted in British India under the Indian Research Fund Association with the assistance of a Cholera Consultative Committee, "the principal object of which is to discover the relation between typical cholera vibrios, their variants and the aberrant types which have been isolated from cases of cholera or pseudo-cholera and from extraneous sources. This appears to be the fundamental problem at the moment, as much from the point of view of the identification of cholera vibrios as of determining the part, if any, played by vibrios present in cholera carriers, and of the elucidation of obscure points in the epidemiology of cholera."

One of the points considered by the commission was that of the one-dose prophylactic inoculation for cholera in place of the two-dose. It is important especially where large-scale work has to be carried out among an ignorant or prejudiced population. It is always difficult to ensure the return of the individual for his second dose, but much easier to carry out a single-dose procedure. Much depends here upon the dose administered, which in various countries that had employed the single-dose ranged from $4\frac{1}{2}$ to 15 thousand million vibrios. much also depends on other factors, which are still unknown or untried. We may therefore subscribe to the Commission's finding that.—"In the present state of scientific knowledge it is not possible to determine, either by experiments on laboratory animals or by the results of inoculations carried out during cholera epidemics, precisely the minimum number of vibrios necessary to ensure an adequate immunity for practical purposes; moreover, the methods of counting the number of vibrios can only give very approximate results. Furthermore, the efficacy of a vaccine depends on other factors, such as the method of preparation and the choice of strains of cholera vibrios, for which there are no definite or generally applicable rules."

The subject of the "Preparation of a Standard Agglutinating Serum for the Cholera Vibrio" is noticed below (p 896). *W. F. Harvey.*

MORGAN (M. T.). Sur la valeur de la vaccination anti-cholérique dans la pratique quarantenaire. [**Anti-Cholera Vaccination in Quarantine Practice.**].—*Bull. Office Internat. d'Hyg. Publique.* 1934. Apr. Vol. 26. No. 4. pp. 682-687. With 2 diagrams.

Data for assessment of the value of vaccination in quarantine practice are taken from the reactions to anti-cholera inoculation in producing serum antibodies.

If the presence of antibodies can be taken as a measure of immunity, it would seem clear that a real rise is not to be expected until after the fifth day from the date of inoculation, when it takes place rapidly. It is a little more rapid after a second inoculation. The duration of the immunity may be put down as not being less than one year. In quarantine practice inoculation must be considered from the point of view of the person arriving from an infected locality and not that of a person

arriving in an infected locality. As the incubation period of cholera is from 1 to 5 days, a person from an infected place may be regarded as liable to attack during the first 5 days after his departure, a risk which is much diminished if he has had inoculation more than 5 days previous to that departure. It is from the fifth day that a rise in immune bodies takes place as a result of inoculation. Such inoculated persons should be entitled to the benefit of less severe quarantine regulations than the uninoculated. And here also the difference between a person coming from an infected locality and going to an infected locality is obvious. In the latter case maximum protection is desirable and therefore two inoculations are to be preferred. In the first case, however, one inoculation only need be insisted on.

W. F. H

GOHAR (M. A.). **Protective Inoculation against Cholera.**—*Jl. Trop. Med. & Hyg* 1934. Mar. 1. Vol. 37 No. 5. pp. 66-68
With 1 graph.

The results of a well organized and well controlled experiment to test the efficacy of different types of cholera vaccine are set out in this article.

Although the number of animals used in each case is rather small the survival rate is at least different for the separate vaccine series and markedly so from the control series. The types of vaccine were (1) a suspension of heat-killed and intact vibrios, (2) autolysed vibrios, and (3) a mixture of the two, each prepared from a smooth typical strain and each of the same equivalent bacterial strength. Immunization consisted in the injection subcutaneously of the dose equivalent to 500 million, 1,000 million and 5,000 million organisms at weekly intervals. Some animals succumbed to the immunization process. The testing dose was one of 2,000 million organisms given intraperitoneally and the survivals were 3 out of 11, 5 out of 13, 5 out of 12 and 0 out of 14 for the suspension of intact vibrios, the autolysed vibrios, the mixture of the two and the controls respectively. It is tentatively suggested that the mixture may produce the best result by virtue of enhancement of the action of a simple suspension from the addition of vibrio extract.

W. F. H

KHAN (Saranjam). **Prevention of Cholera in Rural India.**—*Indian Med. Gaz.* 1934. June. Vol. 69. No. 6. pp. 323-326. With 4 figs.

Protection of the drinking water supply from contamination is admitted to be an important anti-cholera measure and in no country more than in India. The larger towns have now municipal water supplies so that water-borne cholera is not the serious menace in them that it used to be. It is the villages of India, especially in the cholera provinces where "the chief sources of water supply are ground wells" that are now "also the chief sources of the epidemics of cholera." A device invented by the author, which is fully illustrated by drawings, is put forward as meeting village requirements. The essential requirements for any such device are:—"(a) It must be cheap . . . ; (b) it must be simple; every village carpenter should be able to make it or repair it . . . , and (c) it must be effective in protecting the well from pollution; if bathing or washing is done near it, polluted material . . . should have no chance of getting into the well." Some further

details in the way of requirements are added, such as that:—(1) "Nobody should be able to lower his own bucket but everybody should be able to draw water when required" (2) The well must be completely covered at the top in such a way as to be easily uncovered at any time whenever it is necessary to clean the well. (3) The well must be capable of being used in the ordinary way whenever so desired." [In addition to the very clear drawings one would have welcomed information on the working of an actual installation and an estimate of its actual cost.]
W. F. H

MORISON (J.), RICE (E. Milford) & PAL CHOUDHURY (B. K.) **Bacteriophage in the Treatment and Prevention of Cholera. A Statistical Examination.**—*Indian J. Med. Res.* 1934. Apr. Vol. 21. No 4 pp 789-907 With 9 graphs & 3 maps.

A large volume of data relating to the Assam bacteriophage trial is presented here and analysed in detail by the authors. Although it still seems impossible to obtain a presentation of a trial of any medicament on an alternate case basis with its resultant of two dissimilarly treated populations for the comparison of efficacy, there is great merit attached to this particular trial because of its large scale, the long period which is being covered, and the number of statistical experts who have scrutinized the findings claimed.

Before proceeding to give the summary of this long article, which is furnished by the authors themselves, we may pick out of the text two of their pronouncements for consideration. The test area in which bacteriophage has been applied, we may recollect, is Nowgong. "It is apparent" say the authors, "that whether we take as a control for Nowgong the distant area of Habiganj, the previous history of Nowgong itself, or the adjacent area of Darrang, the result is the same. Something has happened in Nowgong which has not happened before and has not happened in the control areas." The previous incidence of cholera in Nowgong is very strikingly compared with the incidence during the past three years of trial phage. "The death rates month by month since January 1906 have been calculated . . . There has been no period of three consecutive years previous to 1930 in which the death rates have been comparable to those of 1930, 1931 and 1932."

Part I of this important work "deals with the prevention of cholera by the administration of cholera-dysentery bacteriophage to all cases of diarrhoea, dysentery and suspected cholera in the villages by the villagers themselves." Since 1929 epidemic cholera has been altogether absent in the experimental area, Nowgong. "Such absence of cholera during the last three and a-half years did not occur in the arbitrarily selected control area Habiganj . . . nor in the more appropriate control districts adjoining Nowgong, with which previous to 1929 there was a high correlation in the deaths from cholera." In part II outbreaks of cholera in 4 areas, each with peculiar conditions are described. Part III deals with four epidemics of cholera, in two of which bacteriophage was used while in the other two, cases "were taken to hospital and other forms of treatment were used" for comparison. Of the first two phage-epidemics it is said that "the cases treated with bacteriophage showed a mortality which, in each case, approximated a constant level. The effect of bacteriophage was as great at the beginning of the epidemic as at the end." It is interesting to learn that in one epidemic where facilities existed for the natural distribution of phage the

mortality in untreated cases showed a regular fall. In another epidemic where these facilities were non-existent the mortality remained high right into the last week of the epidemic. Part IV relates to an outbreak in which investigation was made into the subsequent cholera cases occurring in houses according to whether phage was administered to the first case or not, and demonstrated that "in groups in all other respects alike, the number of subsequent cases in houses is significantly less when the first cases in these houses received bacteriophage."

The conclusion so far arrived at by the authors is — "The results establish a sufficient probability in favour of a significant effect of the administration of bacteriophage to form a basis of practical policy in the treatment and prevention of cholera in villages." W. F. H.

AOKI (K.) & OSHIRO (T.). Ueber die spezifische und unspezifische Form von Choleravibrionen. [**The Specific and Non-Specific Forms of Cholera Vibrio.**]—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1934. Sept. 18 Vol. 83 No. 3/4. pp. 291-296. [Summary appears also in *Bulletin of Hygiene*]

Three types of cholera vibrio are recognized in Japan, the typical, the atypical and the intermediate types. No investigation appears yet to have been made into the existence of specific and non-specific antigenic components of the cholera vibrio, as in the case of other bacteria. These two components have now been obtained by setting out from one vibrio strain, preparing a serum to that strain and then testing the serum for its action upon a number of colonies of the strain. Colonies were separated which, while giving strong agglutination with the serum, showed differential characters with respect to their absorptive reactivity to the serum. These were the specific and non-specific forms, possessing specific absorptive and non-specific absorptive receptors respectively. A large number of vibrio strains were now examined for their reaction to specially prepared sera. The authors conclude from their researches that.—(1) Two serologically differentiated variation forms, specific and non-specific, are to be found among cholera vibrios and still another form in which a mixture of specific and non-specific receptors exists. (2) These 3 forms correspond with the three recognized Japanese cholera vibrio types. (3) The specific receptors are heat stable while the non-specific receptors are partly stable partly labile. (4) The three forms appear to be capable of transformation the one into the other. W. F. H.

LINTON (Richard W.), MITRA (B. N.) & SHRIVASTAVA (D. L.). **Studies on the Antigenic Structure of *Vibrio cholerae*. Part V. Analyses of Vibrio Proteins: Nitrogen Distribution.**—*Indian J. Med. Res.* 1934. Jan. Vol. 21. No. 3. pp. 635-638.

Analysis of the protein fractions of the cholera and cholera-like vibrios was carried out by two methods, the nitrogen distribution method of van Slyke and the racemization method. The former method is the subject of communication and shows little difference between the agglutinable galactose-containing cholera vibrios and the non-agglutinable arabinose-containing water vibrios. In fact the authors' "figures do not give any indication that any marked

differences in nitrogen distribution exist among these vibrios" It is evident also "that the vibrios have a relatively simple protein structure"

W. F. H.

LINTON (Richard W.), MITRA (B. N.) & SHRIVASTAVA (D. L.). **Studies on the Antigenic Structure of *Vibrio cholerae*. Part VI. Analyses of Vibrio Proteins: Racemization.**—*Indian J. Med. Res.* 1934. Apr. Vol. 21 No. 4 pp 749–760. With 2 graphs.

In this sixth part of the series of studies on the antigenic structure of the cholera vibrio it is the proteins which have been studied by the method of racemization.

The former studies of the authors have resulted in the formation of 3 groups of vibrio—Group I from clinical cholera, agglutinable and of polysaccharide I type (galactose-containing), Group II from clinical cholera, agglutinable and of polysaccharide II type (arabinose-containing); Group III isolated from water in a cholera endemic area, non-agglutinable and of polysaccharide II type (arabinose-containing). In the new studies it has been found that two proteins only were present, I and II, and that protein II shows a more rapid loss of optical activity in alkaline solutions than protein I. With the addition of this new character to the three vibrio groups mentioned, it has been found that group II has the same protein I as group I and that group III vibrios contain protein II. From the point of view of their content of polysaccharide fractions, their agglutinability and their protein content, "the vibrios of group II are truly intermediate types." The majority of vibrios from clinical cholera, however, are of group I type. A very interesting addendum states that "the fourth possible combination of the two proteins and two carbohydrates . . . has been disclosed through the analysis of an El Tor strain." The combination is, of course, polysaccharide I with protein II.

W. F. H.

DAMBOVICEANU (A.), COMBIESCO (Cornelia), WISNER (Borelly) & SORU (Eugénie). **Caractérisation des vibrations cholériques par leur antigène résiduel. [Characterization of Cholera Vibrios by their Residual Antigen.]**—*C. R. Soc. Biol.* 1934. Vol. 115. No. 9. pp. 993–995.

In this research the conclusion is reached that, "of the characters of true cholera vibrios and paracholera vibrios only the precipitating action of their residual antigens towards specific serums seems to lead to results identical with those given by specific agglutination." The extraction product obtainable from antigens in general and especially from micro-organisms, which gives no protein reaction, contains in its molecule a sugar capable of being set free by more or less prolonged hydrolysis and precipitates *in vitro* with a corresponding anti-serum, is called "residual antigen" or microbial specific polysaccharide.

Twenty-nine vibrios were investigated:—(1) Five vibrios from serious cases of cholera, agglutinating at 1/2,000, furnished residual antigens precipitating *in vitro* with anti-cholera serum. (2) Six vibrios from Iraqi carriers, agglutinating at 1/2,000, did likewise. (3) Four vibrios from Basra, agglutinable at the time of isolation but becoming inagglutinable with subculture, gave residual antigens which only manifested a slight opalescence upon addition to anti-cholera serum. (4) Fourteen vibrios from El Tor, isolated upon the occurrence of a case

of cholera from pilgrims who had come from a district free of cholera for 40 years, and which were not agglutinated by anti-cholera serum, furnished residual antigens that were not precipitated by anti-cholera serum. On the strength of the results obtained the authors have come to the conclusion enunciated.

W. F. H.

DAMBOVICEANU (A.), COMBIESCO (Cornelia) & SORU (Eugénie) Action *in vitro* du bactériophage sur les propriétés du vibron cholérique. [**Action *in Vitro* of the Bacteriophage on the Properties of the Cholera Vibrio.**—C. R. Soc. Biol. 1934. Vol. 115. No. 12 pp. 1320–1322.]

It was found by DOORENBOS that agglutinable, lyso-sensitive, non-haemolysing vibrios could, under the action of bacteriophage *in vitro*, be transformed into non-agglutinable, lyso-resistant vibrios and that 20 per cent. became haemolytic. The experiments of the authors relate to other characters than these and have been carried out on six strains of cholera vibrio: (1) two strains, not agglutinable by trypaflavine, having a very restricted zone of agglutination by acids and a slow speed of cataphoresis, (2) two strains partially agglutinable by trypaflavine, having more extensive zones of acid agglutination and a moderate speed of cataphoresis, and (3) two strains, completely agglutinable by trypaflavine, having very extensive zones of acid agglutination and a speed of cataphoresis twice as great as the first group. Cultures of each were obtained contaminated with bacteriophage and, after the second passage, it was found that the vibrios of the first group had become strongly agglutinable by trypaflavine, their zone of acid agglutination enormously enlarged and their speed of cataphoresis twice as great. The same effects were produced on the second group but the properties of the third group underwent no change. Of the six vibrios used the two of the first group were of S type, the two of the second group appeared to be intermediate in type or mixtures, and the two of the third group were of R type. Thus the action of the bacteriophage was to transform S and intermediate types to R and to be without effect on those which were originally of R type.

W. F. H.

POPESCO-COMBIESCO (Cornelia) & SORU (Eugénie) Recherches sur l'agglutinabilité des vibrions cholériques et paracholériques par la trypaflavine [**Agglutinability of Cholera and Paracholera Vibrios by Trypaflavine.**—C. R. Soc. Biol. 1934. Vol. 115. No. 12. pp. 1317–1319.]

An easily applied method for the separation of S and R forms of bacteria is very desirable, especially as the morphology of colonies is not sufficient for identification. It is claimed that this can be done with trypaflavine by the technique of PAMPANA. A 1–500 solution in 0.9 per cent. salt solution gives immediate agglutination with "rough" forms and none with pure "smooth" cultures. This method has been applied to 100 vibrios of different origin, (1) true cholera vibrios, (2) vibrios from El Tor pilgrimage of 1930, (3) vibrios from healthy carriers of the epidemic in Iraq, and (4) various paravibrios. The results obtained were (a) instantaneous agglutination in 26 strains, (b) partial agglutination in 42 strains, and (c) no agglutination in 31 strains. The

first group is regarded as comprising rough types, the second as a mixture and the third as a pure smooth type. These tryptaflavine types agree well with those which are differentiated by means of an acid-agglutination technique W. F. H.

SORU (Eugène). Le potentiel électrique de quelques espèces de vibrions cholériques [**Electric Potential of Some Cholera Vibrios.**]—*C. R. Soc. Biol.* 1934 Vol 115 No. 12. pp. 1319-1320.

By these experiments the speed of cataphoresis is shown to have no relation to the classification of vibrios as true and paracholera organisms.

A close correlation is established, however, between speed of cataphoresis and the agglutination behaviour of vibrios by the tryptaflavine test (see *ante*). It is explainable by the finding that organisms of R type have a higher negative electric charge than those of S type W. F. H.

YANG (Y. N.) & WHITE (P. Bruce). **Rough Variation in *V. cholerae* and its Relation to Resistance to Choleraphage (Type A).**—*Jl. Path. & Bact.* 1934 Mar. Vol. 38. No. 2 pp. 187-200. [10 refs.]

A special nomenclature has grown up around the subject of antigenic and phage variation which is highly technical. This discussion, it is well to emphasize, "is limited to a comparison of the ultrapure vibrio and its A^r variants." An A^r variant denotes a race of vibrios resistant to A phage. A further limitation of the study has been "to heat-stable antigens of the vibrios and the corresponding antibodies." It is very interesting to learn that the authors recognize the existence of A^r races of *V. cholerae* which have not marked rough characters except their reaction with Millon's solution. In the combined study by the two authors the conclusion is reached that the process of roughening in the cholera vibrio does not differ from that studied in *Salmonellas* and the pneumococcus. It "involves the disappearance of a non-protein and probably carbohydrate containing substance which furnishes the characteristic O-receptor of the smooth organism." All gradations between smoothness and extreme roughness seem to exist.

Some additional experiments by one of the two authors (P. B. W.) lead to the conclusion, expressed in his own words:—"On the whole we are inclined to believe that resistance to A phage is not a modification induced by phage action but that resistant elements are present in the ultrapure culture and survive lysis." W. F. H.

MARRAS (F. M.) & OMAR (Wasfy). **The Influence of Culture Media previously exposed to Ultra Violet Rays on Bacteria. Increase of Antigenic Power in *V. cholerae* and *B. typhosus*.**—*Jl. Egyptian Med. Assoc.* 1934. Aug. Vol. 17. No. 8. pp. 687-696.

The investigations made were into antigenic power, rapidity of growth, microscopic and cultural characters, bacterial activity and pathogenicity for three organisms, *Bact. typhosum*, *V. cholerae* and *V. El Tor* No. 67 (isolated at For in 1930). Antigenic power only forms the subject of this paper, measured by means of agglutination and Pfeiffer reactions and the complement fixation test. The conclusion is reached that:—"Sera obtained from rabbits inoculated with germs cultivated on agar exposed to the action of U.V. rays from a quartz

mercury vapour lamp show greater agglutinating, bacteriolytic and complement fixation powers than sera obtained by micro-organisms developed on ordinary non-irradiated agar." W. F. H.

OMAR (Wasfy) **Cholera and Cholera-like Vibrios examined under the Filtered Ultra Violet Rays.**—*Jl. Egyptian Med Assoc* 1934. May. Vol. 17 No. 5. pp. 433-439.

Thick suspensions of equal opacity were made of 3 types of vibrios—(1) a non-haemolytic agglutinable cholera vibrio, (2) a haemolytic agglutinable vibrio, and (3) a haemolytic non-agglutinable vibrio. These were exposed to a pure ultra-violet beam produced by a quartz mercury vapour lamp with nickel oxide glass filter. The fluorescences given by the 3 suspensions were (1) yellowish, white and bright, (2) less bright and faint mauve, and (3) faint dirty white with a mauvish tinge. W. F. H.

BULLETIN DE L'OFFICE INTERNATIONAL D'HYGIÈNE PUBLIQUE. 1934. July. Vol. 26. Supp. to No. 7 86 pp. With 1 fig.—*Etudes en vue de la préparation d'un sérum étalon agglutinant le vibron cholérique.* [Studies on the Preparation of a Standard Agglutinating Cholera Serum.]

The need for an authoritative pronouncement on serum-diagnosis of the true cholera vibrio has become urgent owing to the many epidemiological problems which are involved. It may be said, with truth, that the Mohammedan pilgrimage of the Hejaz and the quarantine camp of Tor have focussed the attention of all bacteriological laboratories, European and Oriental, upon this subject.

A beginning has been made by the Committee of the International Office of Hygiene at the instigation of the Egyptian delegate with the preparation of a standard serum. This task was entrusted to the institutes of Copenhagen and Bucharest and these "Studies" represent the results obtained by workers in various laboratories with the trial sera furnished to them. It may be well to state at the outset that this "Study . . . is far from having come to an end, it has demonstrated some of the difficulties of the problem and raised questions which require new and delicate investigations." So much for the stage now arrived at, its documentation is given in this supplement to the monthly Bulletin of the Office International d'Hygiène Publique. We need not enter in detail into that documentation, for it is most admirably summarized in the introduction to the monograph.

The differences in positive titre obtained to the test sera furnished to various laboratories were greater with certain strains than with others, but really qualitative divergence was exceptional. Agglutinable strains of vibrio "*appear, therefore, to belong to a fundamental type of cholera vibrio, which is the most widely distributed type and the causal agent of the majority of cases of cholera.*" A considerable number of strains, however, was recorded which were not agglutinable; most of these strains were derived from cases of clinical cholera, but were inagglutinable by the trial sera. Several investigators referred to strains which were feebly agglutinated at the time of their isolation but which became agglutinable to titre with some months of subculture.

Other strains, again, remained permanently inagglutinable. Incidentally this term "inagglutinable" is a misnomer, for the inagglutinable vibrios are agglutinable by their own homologous sera. Former researches on this subject of inagglutinability were largely carried out before the significance of the antigenic alteration involved in the passage of an organism from the "smooth" to the "rough" (rugose) variant was appreciated. "It is possible that several of these serological individual types will ultimately prove to be only variants of the principal type," and, of course, that some of them may prove to be truly distinctive types.

One of the most important contributions to the subject of differentiation of the cholera vibrio is that of the Danish institute, which found that, next to serum reaction, the fermentation of three sugars furnished the best diagnostic method. These three sugars are saccharose, arabinose and mannose and their fermentation appears to be stable. The correlation between fermentation and agglutinability, inagglutinability and spontaneous agglutinability is close and gave, with the positive or negative fermentation result, six different vibrio types. Out of 240 "agglutinable" strains 239 gave the reaction, saccharose +, arabinose 0, mannose+ and one gave saccharose +, arabinose 0, mannose 0. At the same time 27 inagglutinable strains out of 125 and 13 spontaneously agglutinable strains out of 14 gave the same fermentation reaction as the agglutinable vibrio. The conclusion (Danish) is drawn that "the great majority of the strains examined—239—belong from the point of view of culture and serological properties to a fundamental ['principal'] type which includes all the classical strains of cholera examined." This fermentation type may then be accepted as the principal or fundamental type of the true cholera vibrio.

Other tests were investigated—the precipitation test, haemolytic power even although restricted to the blood of the goat, the cholera-red reaction and susceptibility to the currently used bacteriophage types. None of them, not even the fermentation test, "furnishes a certain diagnosis when the agglutination has not given a definite result."

To summarize.—"The greatest uncertainty continues in regard to the significance of inagglutinable vibrios isolated from clinical cases of cholera. Are they only variants of the fundamental agglutinable type . . . or are they fixed races? Can they be grouped into serological types? If such types exist can the disease produced by them be confused with true cholera? What is their importance from the point of view of epidemiology?"

"In conclusion the Cholera Commission does not consider that it can at present recommend the preparation of a standard serum. Research is still required and should be carried out in those countries where epidemics of cholera and cholera-like diseases occur. In those countries the points which require elucidation are:—

(a) What advantage is there in the use of sera prepared with antigen O [Antigen O is the antigen of the body of the vibrio, which is thermostable?]

(b) Are different serological types met with in true cholera and how are they to be differentiated?

(c) If types can be distinguished, what is the clinical and epidemiological role to be accorded to each?"

We may add the following excerpt from the Danish memorandum:—

"As for the El Tor strains we can assert that they do not form a homogeneous biochemical and serological group. On the contrary we find in our material some El Tor strains which cannot be distinguished from classical strains of the cholera vibrio without taking into account their positive haemolytic power."

W. F. H.

HEIBERG (Borge) Des réactions de fermentation chez les vibrios. [**Fermentation Reactions of Vibrios.**—*C R Soc Biol.* 1934. Vol. 115. No. 9. pp 984-986]

The possession of 375 different strains of vibrios has enabled the author to make out a classification of them on the basis of their fermentation reactions. He comes to the conclusion, from using 20 carbohydrates and alcohols, that three are all important, namely, the hexose mannose, the disaccharide saccharose, and the pentose 1-arabinose

After the preliminary trials on 100 strains, which determined the relative importance of the several sugars, 275 other strains were classified on the basis of fermentation of the three sugars mentioned. Group I was much the largest and was represented by vibrios fermenting saccharose and mannose in 20 hours and not fermenting arabinose. In this group there were 239 vibrios agglutinable by cholera serum, 27 non-agglutinable and 13 spontaneously agglutinable. In group II, fermenting saccharose but not fermenting either arabinose or mannose, there was only one vibrio, vibrio Dunbar, which was agglutinable, while 76 were non-agglutinable. The conclusion is drawn that, before a vibrio, especially a non-agglutinable vibrio, should be called a true cholera vibrio it must at least ferment saccharose and mannose in 20 hours and not arabinose.

W. F. H.

FLU (P. C.). Het El-Tor vraagstuk in verband met de bacteriologische en serologische diagnostiek der cholera-vibriën. [**El-Tor and Cholera Vibrios.**—*Nederl Tijdschr v. Hyg, Microbiol en Serol.* 1934 Vol. 8. No. 4. pp. 292-339. [44 refs.]

The question of what is a cholera vibrio seems to turn mainly on the point of the degree of specificity which is to be accorded to the agglutination of a test vibrio and its behaviour as regards haemolysis and haemodigestion. Flu here expresses and illustrates his well known views and draws the conclusions:—

(1) A true cholera vibrio, which was originally non-haemolytic, can acquire this character: the haemotoxin is identical with that produced by an agglutinable El-Tor vibrio

(2) Cholera vibrios isolated from acute cases are agglutinable to or near to high-grade cholera serum titre limits, give the Pfeiffer reaction, fix complement with specific cholera serum, show haemodigestion on 10 per cent. goat blood agar and haemolyse the erythrocytes in 10 per cent. goat blood bouillon.

(3) The possibility exists that cholera vibrios which have remained a long time in the human body develop haemotoxic properties, which makes them resemble the agglutinable El-Tor vibrios. W. F. H.

ZIMMERMANN (E.). Weitere Beobachtungen ueber die Hämolysine der Vibriën. [**Further Observations on the Haemolysin of Vibrios.**—*Ztschr. f. Immunitätsf. u. Experim. Therap.* 1934. July 23. Vol. 82. No. 5/6. pp. 495-505.]

A back and forward argumentation on the identity of the cholera and El Tor vibrios still continues. The points made by the author are that, (1) the blood agar plate is not so suitable as blood bouillon for determination of haemolysing power, and that (2) a reference to haemolysis must include the species of animal whose blood is used for test.

His culture medium for test was a blood-peptone-asparagin-ammonium lactate bouillon and the strains used were 28 cholera and 9 El-Tor, selected for special study out of a total of 112 vibrio strains. As a result of his experiments he finds that the power to haemolyse is a fixed property of vibrio strains which cannot be altered by bacteriophage action nor by passage through animals. Most of the true cholera strains can form a thermolabile human blood haemolysin. The human blood plus sheep blood haemolysing vibrios are El Tor strains and those haemolysing only human blood are cholera strains *W. F. H.*

SHODA (T.), KOREYEDA (T.) & OTOMO (T.) **The Viability of Cholera Vibrios in the Human Excreta.**—*Jl. Public Health Assoc. Japan.* 1934. Apr. Vol. 10. No. 4 pp. 1-9.

The object of the experiments made by the authors was to determine the viability of cholera vibrios in human excreta under varying temperature conditions. The temperatures used were 37°C., room temperature and that of an ice-box. Under all the conditions of experimentation viability was greatest in the ice-box. Application of the results to the practice of examination for cholera carriers or cholera cases is that the material to be examined should be kept cooled

W. F. H.

KUROYA (Masahiko) & ONO (Hiroshi) **On the Types of Cholera Vibrio of the Shanghai Epidemic of 1932. (Second Report.)**—Reprinted from *Jl. Shanghai Sci. Inst.* 1933. Dec. Section 4. Vol. 1. pp. 41-68. With 1 folding plan.

As standards "the following 3 strains were used . . . Inaba (Original type), Hikojima (Middle type) and Ogawa (Variant type)." The research consisted in typing by the usual bacteriological methods and it was found that 48 strains of cholera isolated during the 1932 epidemic in Shanghai were of the "variant" type and 5 of middle type.

W. F. H.

v. SZATHMÁRY (J.) **Variabilitätsstudien an Vibrionen. [Studies in Variability of Vibrios.]**—*Zent. f. Bakt. I. Abt. Orig.* 1934. May 7. Vol. 131. No. 5/6. pp. 366-374.

The vibrios used were water vibrios. By cultivation in the presence of rabbit erythrocytes the haemolytic power was increased, liquefaction of gelatin accelerated, coagulation of milk abolished and agglutinability increased. Passage by the human intestine, effected by injection into the mucosa of portions obtained from the pathologist, produced certain changes. These were—abolition of the power to coagulate milk, delay in liquefaction of gelatin, first delay and then abolition of the liquefaction of coagulated blood serum. Precipitability of metallic salts was increased and power of capillary rise was lowered. No adaptation to the human intestine could be demonstrated.

W. F. H.

PELLAGRA.

SINAI (I) Contributo all'epidemiologia della pellagra in Costantinopoli [**Epidemiology of Pellagra in Constantinople.**—*Ann. d'Igiene.* 1934 Mar Vol 44. No. 3 pp 245-247]

An account is given of pellagra in Constantinople.

During 17 years of practice in Constantinople the author has seen many cases of pellagra. In 1931 the number of cases increased, and the disease was of greater severity, with frequently a fatal termination. Nearly all the patients were Jews, and the disease seemed to pick out members of this race even when they lived in scattered groups among the Mahommedans, who themselves escaped. Though most of the cases were poor, there seemed to be no definite quantitative food deficiency. The consumption of unleavened bread was regarded as the only probable causative factor. Unleavened bread is eaten by the Jewish community during the eight days of Passover, and during the following month (*i.e.*, about Easter). Formerly the sale of this bread was under religious control, and only the best grain was used. Now, however, there are no restrictions, and it happens that unsold stocks of the previous year are sold as fresh in the following spring. The author suggests that possibly a germ develops in the stored flour and thus gives rise to pellagra.

[Though an organismal factor is suggested by the author, it is possible that the absence of yeast in the bread may be of importance. I am informed that in strict Jewish families no leaven, *i.e.*, no yeast, is allowed in the house during the eight days of Passover. Afterwards many Jews continue to eat unleavened bread as a delicacy, but not to the exclusion of leavened bread.]

A. D. Bigland.

BREDMOSE (Georg V.). Undersøgelser over pellagras forekomst paa Viborg sindssygehospital i aarene 1924-33 [**A Study of the Incidence of Pellagra in the Viborg Asylum in the Years 1924-33.**]—*Hospitalstidende.* 1934. June 12. Vol. 77 No. 24. pp. 694-702. [14 refs.]

The recent recognition of pellagra as an asylum disease led late in 1933 to a search for cases of this disease in the Danish Government asylums, several of which have yielded a modest crop of such cases. Bredmose's investigations cover the 10-year period 1924-33. A scrutiny of the records revealed 7 cases, the earliest being observed in 1927.

There was no chronological uniformity in the appearance of the various symptoms, with this exception that the changes in the skin invariably occurred after the onset of the diarrhoea. The last 2 cases were so recent that the correct diagnosis led to the institution of specific treatment with vitamin B₃ foods and preparations. In both these cases the pigmentation and hyperkeratosis reacted satisfactorily, disappearing altogether in one case. Various other manifestations of pellagra diminished under this treatment, but there was no improvement in the mental condition. A relative lymphocytosis was found in 3 cases and spinal symptoms in 5. It would seem that secondary pellagra may occur in any form of mental disease, and that a special pellagra psychosis is not demonstrable. The patient who suffers from protracted intestinal disease or who refuses to eat is liable to contract

pellagra, the incidence of which in the Danish asylums is somewhere between 3 and 10 per thousand. With timely and appropriate treatment, the prognosis ought not to be bad.

C. Eillingston.

FLINKER (Robert). Die Lokalisation der pellagrösen Hautveränderungen. [**Localization of the Skin Changes in Pellagra.**]—*Schweiz. Med. Woch.* 1934. Feb. 17. No 7. pp. 150-153. With 1 fig. [21 refs]

A description of the usual sites of dermatitis in pellagra is given. It is pointed out that not only light or pressure, but any irritant applied to the skin during the eruptive stage of the disease will cause dermatitis.

It used to be thought, and still is by holders of the photo-dynamic theory, that the skin eruption in pellagra occurs under the influence of light. The author has kept under observation some 60 pellagrins for the purpose of studying the skin localization of the disease. It was found that in addition to the typically situated rash, there were two cases of generalized branny desquamation with pigmentation, and in four cases the same appearances were localized to the abdomen and loins. Stress is laid upon the importance of the rash occurring over pressure areas. In addition to such factors as light and pressure, at a certain stage of the disease any source of irritation wherever applied produces a typical pellagrous eruption. Thus, in two cases during the early part of the natural eruption stage, the application of a mustard leaf for one hour a day (in one instance on the chest, and in another on the loin) caused a typical dermatitis in a few days. In a third case, showing more chronic skin changes, the mustard leaf caused a reaction if anything less marked than that produced in a normal control. Thus it will be seen that a chemical irritant will produce typical dermatitis when applied to the skin of pellagrins during the ingravescant stage of the natural eruption. Any area of the skin surface can be so affected.

A. D. B.

SABRY (Ibrahim) **On the Intimate Relationship between Pellagra and Pemphigus.**—*Jl. Trop. Med. & Hyg.* 1934. Aug 1. Vol. 37. No. 15. pp. 225-231. Also in *Jl. Egyptian Med. Assoc.* 1934. Sept. Vol. 17. No. 9. pp 755-772.

The similarity between the different types of pellagra and pemphigus is pointed out, and the possibility of both diseases being due to the same toxin, dopa, is suggested.

The author has already put forward his view that pellagra is caused by the toxin, "dioxypyhenylalanine," or dopa [see this *Bulletin*, Vol. 30, p. 149]. He has also suggested that this toxic dopa is oxidized by the basal cells of the skin to non-toxic melanin, and that the hyperpigmentation of pellagra is Nature's way of neutralizing the poison and overcoming the disease.

Pellagra and pemphigus have always been regarded as two distinct diseases on account of the differences in skin changes and geographical distribution. Nevertheless the author was struck by the similarity between some cases of pellagra and pemphigus. He points out that the excessive melanin formation about the skin lesions seen in pemphigus vegetans is identical with that found in pellagra, and he suggests

that both diseases are associated with the presence of the same toxin, dopa. In support of this view the following points are stressed :—

(1) Both diseases present different types and varying degrees of malignancy. "The wide variations observed in the severity and degree of malignancy in one and the same disease are variations much wider than those existing between certain types of pellagra on the one hand, and certain types of pemphigus on the other hand."

The differences between the two diseases may be due either to slight alterations in the causal toxin or to individual or racial peculiarities

(2) Both diseases tend to affect the skin, the gastro-intestinal system and the nervous system. The changes in the last two systems, it is claimed, are almost identical in corresponding types of both diseases.

(3) There is a close correspondence between the clinical types of both conditions, especially in the acute malignant forms.

The author is of the opinion, after lengthy discussion and argument, that the skin lesions of pellagra are not so very different from those met with in pemphigus. He has been struck by the fact that most of the pemphigus cases in temperate zones occur among the Jews or "persons of otherwise oriental (*i.e.*, tropical) ancestry," and he comes to the conclusion that "pemphigus is pellagra in disguise; pellagra moulded by northern environments." When the skin is naturally resistant, as it is in tropical races, the response to dopa is the hyper-pigmentation of pellagra and, conversely, the response in less resistant skins is of the nature of pemphigus. The various ways in which a toxin such as arsenic affects the skin (pigmentation, bullae formation, etc.) is a very interesting point in this respect and the possibility of its action upon the adrenal glands is suggested.

Four cases of pemphigus and one case of "malignant pemphigus-pellagra" were treated by the author's sodium thiosulphate method (daily intravenous injections of 10 cc. of a 10 per cent. solution). Two cases made a good recovery and three died.

A. D. B.

WHEELER (G. A.) & HUNT (D. J.). **The Pellagra-preventive Value of Green Onions, Lettuce Leaves, Pork Shoulder, and Peanut Meal.**—*Public Health Rep.* 1934 June 22 Vol. 49. No. 25. pp 732-736.

The authors continue their studies dealing with the pellagra-preventive value of various foodstuffs

Canned green onions and canned lettuce leaves are found to be poor in P.P. factor, while lean pork shoulder and peanut meal are good sources of this accessory.

A. D. B.

SEBRELL (W. H.). **Table showing the Pellagra-preventive Value of Various Foods.**—*Public Health Rep.* 1934. June 29. Vol. 49. No. 26. pp. 754-756. [18 refs.]

A full table of various foodstuffs, showing the pellagra-preventive value of each, is given. This table is intended to be used in the treatment and prevention of pellagra, and only those foods are included which have been tested in both human beings and dogs. The foods are graded for this purpose into four groups: "Good," "Fair," "Slight," and "None." It is important to note that these gradings refer only to the actual daily amount of the food given in the table.

The list will be found to be most useful by those called upon to deal with the treatment and prevention of pellagra, but it is unfortunately impossible to include the actual table in a short abstract A D. B

GUILLAIN (G.), BERTRAND (I.), MOLLARET (P.) & LEREBoullet (J.).
Étude anatomique d'un cas français de pellagre avec paraplégie.
[Anatomical Study of a Case of Pellagra with Paraplegia.]—*Bull.
et Mém. Soc. Méd. Hôp. de Paris*. 1934. May 21. 50th Year.
3rd Ser. No 16 pp 650-657. With 7 figs

This contains a detailed account of the neuro-histological findings in a case of pellagra occurring in France.

At a meeting of the Société Médicale des Hôpitaux de Paris on March 27th 1931, a case of pellagra in a Frenchman aged 56 was shown. In addition to skin manifestations a spastic paraplegia had been present for six months. Under treatment the paraplegia improved for a time, but later it increased again and soon became complete. Oedema of the legs and perforating ulcers of the feet were noted. The trunk, arms, cranial nerves and mentality remained normal throughout. Phthisis supervened and the patient died on November 30th, 1932.

A detailed post-mortem examination of the nervous system was made. The following are among the important findings—The brain as a whole appeared normal, but the spinal cord showed extremely widespread lesions, involving all the segments and attacking the posterior and antero-lateral columns to a variable degree. A full account is given of the appearance of the various tracts at different spinal levels and those particularly interested in the subject should consult the original paper. Some of the anterior horn cells in the cervical region showed atrophic changes with alterations in pigment distribution and nuclear position. All the ganglion cells were fully charged with lipo-pigment. Slight secondary changes in the neuroglia were present and the vessels showed no endarteritis, though in a number of capillaries hyaline thickening of the wall external to the endothelium was observed. Perivascular infiltration was absent. The Betz cells in the cerebrum, according to some workers affected in pellagra psychoses, were normal in this case and in the peripheral nerves no myelin changes could be demonstrated. The products of disintegration in the spinal cord were found to be essentially of a lipoid nature.

It seems, therefore, that the different toxins met with in pellagra have a predilection for certain parts of the nervous system, attacking either the cellular elements or the myelinated tracts. In this case the spinal cord appearances were similar to those seen in the sub-acute combined degeneration of pernicious anaemia, the pyramidal tracts being especially involved in the lower segments of the cord and the columns of Goll and the spino-cerebellar tracts in the upper.

A. D. B.

HANSEN (P.) Et tilfælde af sekundaer pellagra hos en mand. [A Case of Secondary Pellagra in a Man.]—*Ugeskr. f. Læger*. 1934. Vol. 96. pp. 943-945. With 3 figs.

The first case of pellagra recognized as such in a man in Denmark is recorded by Hansen who, like many of his Danish colleagues, has been on the look out for secondary pellagra since HESS-THAYSEN published his investigations on the subject.

The patient was a tramway official, aged 44, of a neurasthenic temperament. Having been told in 1905 that he suffered from colitis, and that it required dieting, he took his régime henceforth so much to heart that he dispensed altogether with milk and the coarser forms of bread. His neurasthenia merged into insanity, and he developed the characteristic symmetrical dermatitis, pigmentation, and hyperkeratosis of pellagra. Other manifestations included diarrhoea, indigestion, vomiting, anorexia and considerable loss of weight. No local treatment of the dermatitis was attempted, and a rapid and striking recovery was effected merely by a change of diet. He was given medicinal yeast, dried liver, eggs, oranges and butter, as well as certain preparations supposed to be rich in vitamins. His recovery was the more dramatic as, when this dietetic change was instituted, he seemed to be moribund.

C. Lillingston

RUD (Einar). Et tilfaelde af latent pellagra. [A Case of Latent Pellagra.]—*Hospitalstudende* 1934 May 1 Vol 77. No. 18. pp 513-516.

This patient had no rash or pigmentation of skin and the diagnosis of pellagra rested on the improvement in response to a dietary rich in vitamin B.

A. G. B

SLATINEANU (Al.), NITULESCU (J), FRANCKE (M), SIBI (M) & PARASCHIVESCU (Z.) L'ammonurie et ses rapports avec l'équilibre acidobasique dans la pellagre [Ammonuria and Liver and Kidney Function in Pellagra.]—*C. R. Soc. Biol.* 1934 Vol. 116. No. 26. pp. 1110-1112.

—, —, SIBI (M.), CANTACUZINO (L.) & LUPU (E.). De l'insuffisance hépatique dans la pellagre—*Ibid.* pp. 1113-1115.

—, —, —, FRANCKE (M) & VEIT (E.). Exploration fonctionnelle du rein chez les pellagres.—*Ibid.* pp. 1115-1117.

Observations upon "ammonuria" and liver and kidney function in pellagra are recorded and described.

1. Observations were made upon 70 pellagrins in whom dermatitis was fully developed. In 57 cases (81 per cent.) the ammoniacal coefficient of the urine was higher than normal. This "ammonuria" often coincides with a condition of acidosis in the blood and may be considered as a reaction on the part of the organism against the acidosis. Various other biochemical estimations are also recorded.

2. Hepatic insufficiency in pellagra has been recognized for a long time. The authors employed various methods for determining liver function, and hepatic insufficiency, by at least one of these tests, was proved to be present in 88 per cent. of pellagra cases.

3. A study of the literature shows that some observers have noted defective kidney function in a certain number of pellagrins. In the present series of experiments various tests were employed, including estimations of blood nitrogen, urea and phenolsulphonephthalein elimination, and chloride concentration capacity of the kidney. Of 55 pellagra cases observed, only 19 gave normal results in response to these tests; 45 per cent. showed an altered Ambard's coefficient; 30 per cent. showed a defective elimination of phenolsulphonephthalein; and 21 per cent. were found to have a defective chloride concentration capacity. Slight albuminuria was frequently found, but this is not regarded as certain evidence of functional renal trouble.

A. D. B.

HELMER (O. M.), FOUTS (Paul J.) & ZERFAS (L. G.). **Gastro-Intestinal Studies. III. Determinations of Enzymes on Autopsy Specimens from Cases of Pernicious Anemia and Pellagra.**—*Arch. Intern. Med.* 1934 May Vol 53. No. 5. pp 675-679. [14 refs.]

The authors give their conclusions as follows —

"1. The gastric mucosa obtained from three patients with pernicious anaemia contained no pepsin or rennin

"2 Pepsin and rennin were present in the gastric mucosa of pellagrins, although in smaller quantities than in persons who died of cardiac failure and pulmonary embolism.

"3. The pancreatic tissue from the persons with pernicious anemia and pellagra contained normal amounts of tryptic, amylolytic and lipolytic enzymes as compared with that from persons who had died of cardiac failure and pulmonary embolism.

"4. The duodenal mucosa from persons with pernicious anemia and pellagra produced sufficient enterokinase to activate fully the trypsinogen of the pancreatic tissue"

A D. B.

STANNUS (Hugh S.). **Vitamin A and Pellagra.** [Correspondence.]—*Lancet.* 1934. Oct. 6. p 785.

In reference to a leading article on Vitamin A and the skin Dr. Stannus points out that the skin lesions under discussion, now considered to be a manifestation of Vitamin A deficiency, were first described in 1911 by himself in association with pellagra. Other lesions noted were irregular erosions of the tongue, excoriations at the angles of the lips and palpebral fissures, erosions about the prepuce, anus and vulva. Other symptoms such as dimness of vision, apathy, diarrhoea have been associated with these skin lesions—all symptoms common to pellagra. He recalls that MELLANBY believes pellagra to be due to a Vitamin A deficiency, and to meet the objections of GOLDBERGER's followers suggests that Vitamin A may be rendered ineffective in the absence of some other nutritional factor such as Vitamin B₂. Stannus thinks that pellagra may easily go unrecognized. A G. B.

GHALIOUNGUI (Paul). **Pellagra in Sudanese Millet-Eaters.** [Correspondence.]—*Lancet.* 1934. July 21. p 164

HIEMCKE (H. J Th) **Pellagrosied bij aphthae tropicae**—*Nederl. Tijdschr v. Geneesk.* 1934 Aug 25 Vol 78 No 34 pp. 3869-3877. With 5 figs on 4 plates [21 refs] French summary (3 lines).

REVIEWS AND NOTICES.

MÖNNIG (H. O.) [B.A., Dr. Phil., B.V.Sc., Professor of Parasitology, Faculty of Veterinary Science, University of Pretoria, etc.] **Veterinary Helminthology and Entomology. The Diseases of Domesticated Animals caused by Helminth and Arthropod Parasites.**—pp. xvi + 402. With 264 figs (22 on 12 plates) 1934. London: Baillière, Tindall & Cox, 7 & 8 Henrietta Street, W.C.2 [30s.]

As the author points out in his preface, no text book which deals adequately with parasitic diseases of the domesticated animals has appeared since NEUMANN's work in 1892. In the interval, there has been a considerable increase in our knowledge, especially with regard to anthelmintics and methods of control. As a teacher the author has experienced the want of a suitable text book for veterinary students and practitioners, and the present work is an attempt to supply that need. It is no exaggeration to say that Prof. Monnig has admirably succeeded in his object, and that the present generation of veterinary students and even practitioners owe him a debt of gratitude. It is not encyclopaedic, such is not possible. Certain items which appeal to us in Europe are missing, but the author has tuned in to our atmosphere to a surprising degree, although the African veldt often looms up before us. There is a short account of several aspects of parasitism in general which is followed by a section on technique. This deals with the collection and preservation of worms and arthropods, the making of permanent preparations, and clinical diagnostic methods. Among the latter are included the skin scraping, the direct smear, concentration, floatation and egg counting methods, faecal culture, blood examination and the allergic reactions. It is doubtful whether the student could carry out the Casoni test for echinococcosis from the description on page 21. The section dealing with helminths contains sufficient morphological details to make the classification, life cycles and habits clear and interesting. The most important parasitic diseases are each dealt with in the following manner, the morphology of the parasite, life cycle, pathogenesis, symptoms, post-mortem, diagnosis, treatment and prophylaxis.

There are figures of the eggs of the common trematodes, cestodes, and nematodes. One misses *Limnaea truncatula* in Plate I of the shells of various important snail intermediate hosts of trematodes. In the Plate too, one notices the author uses *Limnaea* but in the text we see *Limnaea*. Fascioliasis is briefly yet fully discussed in all its aspects. Apart from *Diphyllbothrium* and *Sparganum* the only order of cestodes dealt with is that of the *Cyclophyllidae*, and taeniasis receives full consideration. In the round worms the superfamilies of former days are now natural orders. Ascariasis, haemonchiasis, trichostrongylosis, oesophagostomiasis, respiratory helminthiasis, equine strongylidosis, and many other worm diseases of animals and birds are dealt with.

It is refreshing to see a short account of leeches, many authors being content to dismiss them by saying that they are not regarded as helminths. Among arthropods the following classes are considered, viz: Crustacea, Myriapoda, Pentastomida, Insecta and Arachnida, the latter two receiving most attention. After a general account, the blood-sucking flies, those causing internal and external myiasis,

the lice, the fleas, the ticks, mange mites and pentastomes are briefly but sufficiently dealt with

There is a host parasite list with page references for each of the species with which the author deals, viz man, the horse, sheep, goat, ox, pig, dog, cat, fox, rabbit, and several other mammals; among birds, although there are others, the chief are the fowl, turkey, pigeon, duck, goose *Nematodirus filicollis* is not listed as a parasite of any of the ruminants The index will not be found complete enough for the practitioner, but perhaps this will be compensated by the host parasite list

The volume is well printed, illustrated and bound. It should be a guide to the student and should find a place among the reference books of the general practitioner who wants to keep abreast of the times

A. W. Noel Pillers.

GIRGES (Rameses). **Schistosomiasis (Bilharziasis)**. With a Foreword by Professor Ernest Carroll FAUST—pp. xii+529. With 1 plate, 185 numbered & unnumbered figs. 1934. London John Bale, Sons & Danielsson, Ltd, 83-91 Great Titchfield Street, W 1. [25s.]

From his own great experience in Egypt Girges fully describes haematobian and mansonian schistosomiasis and relies mainly on FAUST and MELENEY for what he has to say on the japonic infection His study of the literature of all forms has been searching, as the number of his citations show, but except for the chapters on Egyptian splenomegaly and the japonic infection there is no list of references; so that for these the reader will be thrown back either on this *Bulletin* to which the author acknowledges invaluable indebtedness, or to KHALIL's Bibliography. The book deals severally and in detail with history, parasitology, epidemiology and geographical distribution, practical study including that of the molluscan hosts, the three infections, specific treatment, and prophylaxis. In the mansonian disease prominence is given to the visceral or splenomegalic type, whose relation to infection by male worms Girges has done so much to clarify. The treatment of all aspects is very thorough. The book is, however, difficult reading with much repetition, and would be greatly improved by drastic reduction. The drawings are excellent, so are the reproductions of photomicrographs by FAUST on the section dealing with the japonic infection, but those of the author would have been improved by lower magnification. Nevertheless this is a fine piece of work written by a busy practitioner and excellently put out.

Clayton Lane.

LOBEL (L. W. M.). **Lepra bubalorum**.—*Dept. v. Econom. Zaken Nederl - Indië. Veeartsenijk. Meded. No. 81*. 1934. 234 pp. With 37 figs. on 24 plates.

Apart from leprosy in the human being rat leprosy is the only form of the disease, or of a similar disease, which has hitherto been recognized. Evidence is now forthcoming that the skin affection here described in buffaloes is caused by an acid-fast organism with most of the characters of a leprosy bacillus. Clinically the disease shows itself in the form of a nodular condition of the skin, where the nodules vary from about 5 to 60 mm. in size and may lie in juxtaposition with one another to form large aggregations. These may ulcerate Altogether in the comparatively short space of time from 1925 to 1934 twenty-one

cases have been discovered in Java and Celebes. The sickness is a very chronic one and indeed the animal is not disabled and is regularly used for work. In two of the cases lesions were present not only in the skin but in the nose. Acid-fast organisms of bacillary type, but also as dark round granules of disintegration, are always found in the skin nodules. They are grouped in typical bundles and globi in very characteristic form, which can be made out with quite low magnifications. These have been found in the nasal lesions as well as the skin, once in regional lymph nodes, but never in the blood or organs. Cultures and attempts to infect other buffaloes, guineapigs, rabbits, pigeons, white rats and mice have all proved negative. The ophthalmic reaction with bovine tuberculin was positive in three out of eight cases. Microscopical sections are troublesome to get owing to the hardness of buffalo skin. The lesion is describable as a granuloma localized in the corium and consisting of highly cellular fatty tissue, containing giant cells, large macrophages (granuloma cells), fibroblasts, a few lymphocytes and still fewer polymorphs: it is not sharply demarcated from the surrounding tissue. Necrosis and calcification are very commonly present. In making a differential diagnosis the field is restricted to diseases due to pathogenic acid-fast bacilli. Tuberculosis and paratuberculosis can be excluded, while the great similarity of grouping of the bacilli, the occurrence of large vacuoles and macrophages (lepra cells) packed with the organisms, and the fatty degeneration combine to form a picture greatly similar to that seen in human leprosy. The conclusion drawn by the author is that "*lepra bubalorum* is a chronic infectious disease caused by acid fast organisms and that the disease agrees closely in its characters with human leprosy."

W. F. Harvey.

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Am	signifies Amoebiasis and Amoebic	Lept.	signifies Leptospirosis
	Dysentery.	Mal	" Malana
Bb	" Benbeni and Epidemic Dropsy.	Misc	" Miscellaneous
Bl	" Blackwater	Myc	" Tropical Mycology
B R	" Book Review.	Oph	" Tropical Ophthalmology.
Chl	" Cholera	Pel	" Pellagra.
C Bu	" Chmatic Bubo and Lympho- granuloma Inguinale	Pl	" Plague
Der.	" Tropical Dermatology	Pro	" Protozoology.
Dys	" Dysentery (Bacillary and Unclassed).	Rab	" Rabies
Ent	" Medical Entomology	R B F	" Rat-Bite Fever
Fev	" Fevers	R.F	" Relapsing Fever and other Spirochaetoses.
G V	" Granuloma Venereum	Sn.	" Venomous Snakes and Snake Venoms.
Hel	" Helminthiasis	Sp	" Sprue
Hist	" Historical	S S	" Sleeping Sickness
H S.	" Heat Stroke	Y F	" Yellow Fever.
K A	" Kala Azar	Y & S.	" Yaws & Syphilis
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 Cardoso, E, with Soper, Penna, Serafim, Jr, Frobisher, Jr, & Pinheiro, 77 (Y F)
 Carman, J. A., 108 (Hel)
 Carmichael, J, 68 (Ent)
 Carneiro, J M., with Patto, 641 (Rab)
 Carothers, J C, 426 (Mal)
 Carothers, J C D, with Anderson, 110 (Hel)
 Carr, L. H., with Buist & Bhatnagar, 318 (Der)
 Carrón, A L & Koppisch, E, 316 (Der)
 Casini, G, with Lega, (189) (Mal)
 Castaneda, M R, with Zinsser, 245, 630 bis, (Fev)
 Castellani, A., (319) bis (Der.)
 Castrounovo, G., 336 (Misc.)
 Catacouzenos, E, with Patrikos, 150 (Rab)
 Catanel, A., 315 (Der.)
 — & Legroux, C., 316 (Der)
 —, with Sergeant, Edm. & Sergeant, A., 418, (436), 704 (Mal)
 Cattaneo, D., 402 (Oph.)
 Cawston, F. G, 380 bis, 774 (Hel), (823) bis (Misc.)
 Ceccarelli, D., (435) (Mal)
 Cedercreutz, A., 536 (Lep.)
 Celli, A., 220 (B R.)
 Central Co-operative Anti-Malaria Society, Ltd., 412 (Mal.)
 Chadwick, C R, with MacHattie & Mills, 114 (Hel)
 Chagas, E, 599 (S S)
 Chang, H H, with Struthers, Lin & Ch'en, 662 (K A)
 Chang, T, with Hu, 804 (Hel)
 Chao, S S, with Reiner, 212 (S S)
 Charlet, with Andréoli, 635 (Fev), 861 (Oph)
 Chassigneux, with Martin & Roussé, 689 (Mal)
 Chatterjee, R, 665 (K A)
 Chatterjee, S N, with Gupta, 98 (R B F)
 Chatterji, N, 404 (Oph)
 Chatterji, S K, with Asheshov, I N, Asheshov, I, Khan & Lahiri, 41 (Chl)
 —, with —, — & Lahiri, 42 (Chl)
 Chatterji, S N, 549 (Lep)
 —, with Muir, 549 (Lep)
 Chatterji, S P, with Muir, 861 (Oph)
 Chaudhuri, R N, with Chopra, 654 (Dys.)
 Chaudhury, S G, with Chopra, 179 (Mal)
 Chelarescu-Vieru, M, with Cruca & Baluf, 687 bis (Mal)
 Ch'en, J T, with Struthers, Chang & Lin, 662 (K A)
 Chen, W K, 45 (Chl)
 Chéneveau, R, 743 (Misc)
 Cherry, R O, with Kellaway & Williams, 100 (Sn.)
 Chesneau, P & Nguyen-duy-Ha, 64 (Ent)
 Chesterman, C C, 205 (S S)
 Chiang, W L & Yang, C S., (189) (Mal)
 —, with —, 681 (Mal)
 Chick, H, 22 (Pel)
 Ch'in, K, 785 (Hel.)
 Ch'in, K Y, with Chung, 663 (K A)
 Chinese Medical Journal, 1 (Lep), (314) (Chl)
 Chiyuto, S, 5, 866 (Lep.)
 Chopra, G S, with Chopra, R N. & Gupta, 667 (Misc)
 Chopra, R N & Bose, S C, 482 (Bb)
 — & Chaudhuri, R N., 654 (Dys)
 — & Chaudhury, S G, 179 (Mal)
 — & De, P, 822 (Misc)
 —, Ghosh, N. N. & Mukerji, A K, 768 (Hel)
 — & Gupta, B M. D., 172, 700 (Mal)
 —, Gupta, J C & Chopra, G S, 667 (Misc)
 —, — & Ganguli, S. K, 176 (Mal)
 —, with Maplestone, 374, 375 (Hel)
 —, Mukherjee, B & Campbell, H G. M., 173 (Mal)
 —, Mukherjee, S. N. & Sundar Rao, S., 808 (Hel.)
 — & Sen, B., 652 (Am)
 —, Sen, B & Sen, S., 282 (Am)
 —, Sen, S & Sen, B, 652 (Am.)
 — & Wahed, A. K. M. A., (726) (Mal)
 Chorine, V, 554 (Lep.)
 — & Gillier, R, 180, (435) (Mal)
 —, Guillery & Montestruc, E, (873) (Lep.)
 — & Koehn, D., 705 (Mal)
 —, with Marchoux, 89 (R F)
 — & Prudhomme, R, 867 (Lep.)
 — & Rodieux, M., 457 (Mal)
 —, with Tisseuil, 554 (Lep.)
 Chorley, C. W., 67 (Ent.)
 Christensen, B. V. & Lynch, H. J., 375 (Hel)

Christophers, R., 725 (Mal)
 Christophers, S. R., 74 (B R)
 — & Missiroli, A., 158 (Mal)
 —, Sinton, J. A. & Covell, G., 517 (B R)
 Christopherson, J. B. & Ward, R. O., 776 (Hel)
 Chrzanowski, B. & Mosing, H., 249 (Fev)
 Chu'an-K'uei Hu & Frazier, C. N., 275 (Y & S)
 Chun, J. W. H., with Wu Lien-Teh, Pollitzer & Wu, 519 (B R)
 Chung, H., 781 (Hel)
 — & Ch'in, K. Y., 663 (K A)
 —, with Lee, 780 (Hel)
 Chworostuchina, M., 882 (Pl)
 Ciaudo, with Graud & Montus, 231 (K A)
 Cibils Aguirre, R. & Saubidet, E. J., (289) (Am)
 Ciento, R. W., 320 (Misc.)
 Cuca, M., Ballif, L. & Chelarescu-Vieru, M., 687 bis (Mal)
 Cuarea, I., 374 bis (Hel)
 Clapham, P. A., 107 (Hel)
 Clarebout, G., with Mouchet, van Hoof, Duren, Fontana, Henry & Henrard, 831 (Y F)
 Clarke, L. P., with Findlay, 841 (Y.F)
 Cleland, J. B. & Gray, J. H., (361) (Misc)
 Clemmesen, S., 27 bis (Pel)
 Cleyndert, P. C. (95) (Lept)
 Cluver, E. H., 771 (Hel)
 Coatney, G. R., 354 (Misc)
 Cochrane, E., (255) (Fev)
 Colas-Belcour, J., with Roubaud, 58 (Ent), 720 (Mal)
 Cole, H. L., 546 (Lep)
 Coleman, G. E., 507 bis, 849 (R F)
 Collignon, E., 409, 712 (Mal)
 —, with Senevet, 156, (727) (Mal)
 Colvin, C., Paton, J. T. & Dawes, S. R., (13) (Lep)
 Combiesco, C., with Damboviceanu & Soru, 894 (Chl)
 —, with —, Wisner & Soru, 893 (Chl.)
 Combiesco-Popesco, C. & Wisner, B., 43 (Chl)
 Combiesco, D., 625, 626 (Fev)
 — & Papesco, C., 242 (Fev)
 —, —, Stamatesco, S. & Angelesco, J., 245 (Fev)
 —, — & Vantu, 626 (Fev)
 Congo Belge, 735 (Misc.)
 Connal, A., 809 (Hel)
 Connell, W. K. & Buchanan, J. C. R., 337 (Misc.)
 Constantinesco, V., with Nicolau & Mathis, 145 (Rab.)
 Continentino, L., (266) (Lep)
 Cook, S. S., 740 (Misc.)
 Cooke, W. E. & McNair, J. S., (726) (Mal.)
 Cooley, R. A., 747 (Misc)
 Cordi, J. M. & Otto, G. F., 395 (Hel)
 Corkill, N. L., 99 (Sn.)
 Cormack, H. S. & Anderson, L. A. P., 149 (Rab.), 406 (Oph.)
 Cornet, with Dodero, 403 (Oph.)
 Cornet, E., 14, 17, 401, 407 (Oph.), 388 (Hel.)
 —, with Houdemer & Dodero, 388 (Hel.), 406 (Oph.)

Corongotó, V. S., (726) (Mal)
 Corradetti, A., (435), 725 ter (Mal)
 Corson, J. F., 201, 215, 582 bis, 583 bis, 584 (S S)
 Cort, W. W., with Otto, 789 bis (Hel.)
 Corti, E., with Kadaner, 92 (Lept)
 Cory, E. N., with Bishop & Stone, (72) (Ent.)
 Costantino, S., 236 (K A)
 Coste, F., Saenz, A. & Costil, L., 276 (Y & S)
 Costedoat, 139 (Sp)
 Costil, L., with Coste & Saenz, 276 (Y & S)
 Cotti, L., (812) (Hel)
 Cottini, G. B., 6 (Lep)
 Courboulès, P. & Mandillon, G. A. L., (823) (Misc)
 Cousin, E., with Sicé & Dantec, 577 (S S)
 —, with — & Rivoalen, 203 (S S)
 Couvy, 37 (Chl)
 Covell, G., with Christophers & Sinton, 517 (B R)
 Craig, C. F., 460 (Mal)
 Craighead, A. C., with Shortt, Malone & McGuire, 642 (Rab)
 Crawford, P. J., with Soper & Rickard, 836 (Y F)
 Crawford, S., 651 (Am)
 Crónica Medico-Quirúrgica de la Habana, 814 (Misc)
 Crostill, J. W. L., 748 (Misc)
 Cross, B., 677 (Mal)
 Cruveilhier, L., with Hagenau & Nicolau, 648 (Rab)
 Cruz, A., 476 (Bb)
 Cruz, A. O., with West, 478 (Bb)
 Cruz, W. O., 136, 797 bis, 798 (Hel)
 Cuénod & Nataf, R., 861 (Oph)
 Culbertson, J. T., 585 (S S)
 Cummins, R. C., 487 (Pel.)
 Cunningham, E. R., Kilborn, L. G., Maxwell, J. L., Morse, W. R., Mullett, H. J. & Dickinson, F., 323 (Misc)
 Cunningham, J., Theodore, J. H. & Fraser, A. G. L., 847 (R F)
 Cushing, E. C. & Patton, W. S., 359 (Misc.)
 Cusset, J. & Goldenfourn, Z., 136 (Hel.)

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 Dalal, N. P., with Greval, 307 (Pl.)
 —, with Row & Gollerkeri, 172 (Mal)
 Damany, P., with Plazy, 120 (Hel), (252) (Fev)
 Damboviceanu, A., 46 (Chl)
 —, Combiesco, C. & Soru, E., 894 (Chl.)
 —, —, Wisner, B. & Soru, 893 (Chl)
 Dang, M. L., with Still, (655) (Am)
 Dantec, with Sicé & Cousin, 577 (S S.)
 Das, G., with Gupta & Majumdar, 411 (Mal.)
 Daspet, M. & Jouchères, H., 284 (Am.)
 Dau, H., with Pijper, 241 (Fev.)
 David, J., (726) (Mal)
 David, J. C., Rajamanikam, N. & Krishna-swamy, R., 821 (Misc.)
 David, N. A., Johnstone, H. G., Reed, A. C. & Leake, C. D., 283 (Am.)
 Davis, G. E. & Parker, R. R., 249, 633 (Fev.)
 —, — & Walker, M. E., 634 (Fev.)
 Davis, M. E., with Macht, 102 (Sn.)

- Davis, N. C., 80, 497, 839, 841 (Y F)
 —, Frobisher, M., Jr & Lloyd, W., 81 (Y F)
 Dawes, S. R., with Colvin & Paton, (13) (Lep)
 Day, P. L., 860 (Oph)
 De, M. N., 663 (K A)
 De, P., with Chopra, 822 (Misc)
 Deasid, C., 747 (Misc)
 Decourt, P., 693 (Mal)
 —, with Sicault, 431, 432 (Mal)
 Dejou, L., with Huard & Roques, (655) (Am)
 De La Camara Cailhau, P., (726) (Mal)
 Delanoé, E., 15 (Oph), (555) (Lep)
 Delanoé, P., 506 *bis*, 507 (R.F)
 Delbove, with Ragiot, (96), 854 (Lept)
 Delpy & Bourret, (603) (S S)
 Demanche, L., with Bovet, 175 (Mal)
 Demidowa, L. W., with Krtischewski, 181 (Mal)
 Demina, N., 279 (Am)
 Demurtas, M. P., (435) (Mal)
 Denney, O. E., 257, 539 (Lep)
 — & Eddy, B. E., 9 (Lep)
 Denny-Brown, D., 786 (Hel)
 Deschens, R., 284 (Am)
 Des Essarts, J. Q., 286 (Dys), 620 (Fev)
 — & Lefrou, G., 550, 867 (Lep)
 Dévé, F., 121, 387, 785 *bis* (Hel)
 DeWolf, H. F., with Spies, 23 (Pel)
 Dhont, C. M., Jr., 705 (Mal)
 Diamantis, A., 775 (Hel)
 Dias, E., 597 (S S)
 Dickinson, F., with Cunningham, Kilborn, Maxwell, Morse & Mullett, 323 (Misc)
 Dinger, J. E., (95) (Lept)
 Dixon, H. B. F., 119 (Hel)
 — & Smithers, D. W., 786 (Hel)
 Dixon, P. K., 16 (Oph), 379 (Hel)
 Dmitriev, I. D. & Artemiev, A. I., 57 (Ent)
 Do Amaral, A., 104 *bis* (Sn)
 — & Monteiro, J. L., 616 (Fev)
 Dobell, C., 352 (Misc)
 Dodero & Cornet, 403 (Oph)
 —, with Houdemer & Cornet, 388 (Hel), 406 (Oph)
 Dodero, J., with Genevray, 646 (Rab)
 Dogra, J. B., with Lal, 235 (K A)
 Donatien, A., with Parrot & Lestoquard, 229 (K A)
 —, with Sergeant, E., Sergeant Et. & Parrot, 423 (Mal)
 —, with —, —, — & Lestoquard, 226 (K A)
 Donskov, G., with Borzenkov, 307 (Pl)
 Dossier, E. M., with Kuteischikow & Bernhoff, 238 (Fev)
 Dossère, E. M., with Silber, 623 *bis* (Fev)
 Dostrowsky, A., 666 (K A)
 Dove, W. E., with Hull & Prince, 745 (Misc)
 Downes-Shaw, A., 542 (Lep)
 Drake, A. A., with Rice & Smith, 858 (Oph)
 Dressler, I., with Manteufel, 92 (R.F)
 Dreyfuss, A., (435) (Mal)
 Drinker, C. K., Field, M. E. & Homans, J., 806 (Hel)
 —, Wislocki, G. B. & Field, M. E., 133 (Hel)
 Droeshaut, with Schwetz, Baumann & Peel, 418, (474) (Mal)
- Duché, J., with Burnier, 315 (Der)
 Dudley, S. F., 493 (Y F), 787 (Hel)
 Duff, D., 496 (Y F)
 Dujardin-Beaumetz, E., (36) (Pl)
 Duke, H. L., 196, 564, 565, 566 (S S)
 Dumont, P., with Van den Branden, 578 (S S)
 Dumont, R., (290) (Am)
 Duncan, D., (435) (Mal)
 Dunn, L. H., 63, 70 (Ent), 218 (S S)
 Dunnewold, R., (823) (Misc)
 Dupont, R., (812) (Hel)
 Durand, R., with Laigret, 246, 623 (Fev)
 Duren, A., with Mouchet, van Hoof, Fontana, Clarebout, Henry & Henard, 831 (Y F)
 Durieux, C., with Mathis, 505, 849 (R F)
 —, with — & Advier, 87, 505 (R F)
 Dusan, J., with Vigne (555) (Lep)
 Duval, C. W. & Holt, R. A., 552, 871 (Lep)
 Duvour, M. E., with Brumpt & Sainton, 787 (Hel)
 Dyer, R. E., 622 (Fev)
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- Earle, W. C., 681 (Mal)
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 Eaton, L. M. & Feinberg, S. M., 165 (Mal)
 Eckhardt, A. E., 169 (Mal)
 Eddy, B. E., with Denney, 9 (Lep)
 Edgecombe, W., 336 (Misc)
 Edwards, F. W., 55 (Ent)
 Eerikens, J. W., with de Langen, 125 (Hel)
 Egorov, A., 305 (Pl)
 Egypt, 18, 862 (Oph), 485 (Pel), 764 (Hel)
 Eisma, M., 392 (Hel)
 Ejercito, A., (726) (Mal)
 Elbel, H., with Bayer, 102 (Sn)
 Eldin, M. S. & Hassan, A., 767 (Hel)
 El Diwany, M. A. M., 775 (Hel)
 Ehot, M. M. & Jackson, E. B., 346 (Misc)
 El Khalidi, H. F., 683 (Mal)
 Elliot, R. H., 404, 860 (Oph)
 Elmes, B. G. T., 317 (Der)
 —, with Smith, 274 (Y & S)
 Elsbach, L., 132 (Hel)
 Elshout, J. M. & Lentjes, L. J. M., 477 (Bb), 603 (S S)
 Emerson, G. A., Anderson, H. H. & Leack, C. D., 262 *bis*, 263, 868 (Lep)
 —, with Anderson & Fisher, 869 (Lep)
 — & Salle, A. J., 547 (Lep)
 Emile-Weil, P., 690 (Mal)
 Epstein, B., 771 (Hel)
 Epstein, E., with Tareev & Gontaewa, 703 (Mal)
 —, with —, Pikul, Gontaeva & Raskin, 698 (Mal)
 Epstein, G. V., 278 (Am)
 — & Zertchaninov, L., 279 (Am)
 Epstein, H., with Tarejew, Gantaeva, Raskin & Bolotina, 174 (Mal)
 Erber, B., with Troisier, Bariéty & Gabriel, 515 (Lept)
 Erfan, M., 114 (Hel)
 Ernstene, A. C. & Riseman, J. E. F., 237 (Fev)
 Erspamer, V., 775 (Hel)
 Escalar, G., 686 (Mal)
 —, with Pecori, 186 (Mal)

Eschbach, H., 251 (Fev)
 Ess, B. J., 262 (Lep)
 Essed, W. F. R., 221 (B.R.)
 — & van Thiel, P. H., 792 (Hel)
 Estrade, F., 879, 884, (888) *bis* (Pl)
 —, with Girard, 879 (Pl)
 Evans, A. M., 723 (Mal)
 Evseeva, V. & Firsov, I., 31 (Pl)
 Ewing, H. E., (72) (Ent)

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 Faddeeva, T., 32 (Pl)
 Paget, G. H., 164 (Mal)
 Fairbairn, H., 559 (S.S.)
 Fairbrother, R. W., 604 (B.R.)
 Fairley, N. H. & Bromfield, R. J., 176 (Mal)
 Fakhry, A., 768 (Hel)
 Falta, M., 859 (Oph)
 Farran-Ridge, C. & Lush, D., 285 (Dys)
 Faust, E. C., 129, 381, 776 (Hel), 335 (Misc)
 —, with Hoffman, 777 (Hel)
 —, Wells, J. W., Adams, C. & Beach, T. D., 800 (Hel)
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 Feinberg, S. M., with Eaton, 165 (Mal)
 Fejgn, B. & Sparrow, H., 624 (Fev)
 Feldt, A., 511 (R.F.)
 Feng, C. T., 870 (Lep)
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 — & Hoeppf, R., 746 (Misc)
 —, with —, 787 (Hel)
 Fennel, E. A., 621 (Fev)
 Fenton, F. G., with Lyle, 862 (Oph)
 Fermi, C., 53 (Ent)
 Fernandez, F., 767 (Hel)
 Fernando, A. S., 858 (Oph)
 Fernan-Nunez, M., (655) (Am)
 Féron, 262 *bis* (Lep)
 Féron, J., 549 (Lep.)
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 Ferreira, J. C., with Mendes, 657 (K.A.)
 Fidanza, E. P., (266) *bis* (Lep)
 Field, M. E., with Drinker & Homans, 806 (Hel)
 —, with — & Wislocki, 133 (Hel)
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 Filatov, A., with Ackerman, 459 (Mal)
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 Findlay, G. M., 498, 500, 501 (Y.F.)
 — & Broom, J. C., 499 (Y.F.)
 — & Clarke, L. P., 841 (Y.F.)
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 Fine, A., with d'Aunoy, 148 (Rab), 630 (Fev)
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 Fischer, O., 336 (Misc.)
 Fischl, V., Kotrba, J. & Singer, E., 510 (R.F.)
 — & Schlossberger, H., 518 (B.R.)
 —, with Singer, 510 (R.F.)
 — & Singer, E., 851 (R.F.)
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Fishbein, W. I., with Bundesen & Rawlings, (289) (Am)
 Fisher, A. C., 775 (Hel)
 Fisher, B. H., with Anderson & Emerson, 869 (Lep)
 Fisl, M., 648 (Rab)
 Fitzgerald, G. H., 282 (Am)
 Fitzgerald-Moore, D. G., 820 (Misc)
 Fitzwilliams, D. C. L., 803 (Hel)
 Fleck, L., with Heschels, 621 (Fev)
 Fletcher, W., 631 (Fev)
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 Fontana, L., with Mouchet, van Hoof, Duren, Clarebout, Henry & Henrard, 831 (Y.F.)
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 Fosbery, F. W. A., (400) (Hel)
 Foshay, L., 348 (Misc)
 Foster, J. H., (655) (Am)
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 Fouts, P. J., with Helmer & Zerfas, 905 (Pel)
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 Francke, M., with Slatineanu, Nitulescu, Sibi, & Paraschivescu, 904 (Pel)
 —, with —, —, — & Veit, 904 (Pel)
 Franklin, E. M., 427 (Mal)
 Frankmann, E., with Jelin, 247 (Fev)
 Fraser, A. G. L., with Cunningham & Theodore, 847 (R.F.)
 Fraser, S. N. D., 1 (Lep)
 Frazier, C. N., with Chu'an-K'uei Hu, 275 (Y & S)
 —, with Ngai, 651 (Am)
 Frégonneau, W., 380 (Hel)
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 Friedlander, R. D., 802 (Hel)
 Friess, E., with Meersseman & Bergondi, 111 (Hel)
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 —, with Davis & Lloyd, 81 (Y.F.)
 —, with Soper, Penna, Cardoso, Serafim, Jr. & Pinheiro, 77 (Y.F.)
 Fröes, H., (189) (Mal.), (823) *bis*, (824) *bis* (Misc)
 Froes, H. P., (813) *bis* (Hel.), (726) (Mal.)
 Frye, W. W. & Meleney, H. E., 284 (Am)
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 Futran, G. S., with Prendel & Zagorovskii, 471 (Mal.)

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 Gaehdgens, with Peter, 819 (Misc)
 Gaffney, H. J., O'D. B., (361) (Misc.)
 Gaiskaya, E. L., 279 (Am)
 Gajdos, E. & Tchang, J., 629 (Fev.)
 Galante, E., 860 (Oph)
 Gallhard, H., 254 (Fev), 745 (Misc.)
 — & Sautet, J., 722 (Mal.)
 Galli-Valerio, B., 107 (Hel.)
 Galloway, I. A., 638 (Rab.)
 Ganguli, S. K., with Chopra & Gupta, 176 (Mal.)

- Gantaeva, A, with Tarejew, Epstein, Raskin & Bolotina, 174 (Mal)
 Garcia, A, with de Leon & de Jesus, 350 (Misc)
 Garcia, O, 274 bis (Y & S)
 Garcia Corselles, T, with Mezquita Lopez, 400 (Hel)
 Garrison, H F, 393 (Hel)
 Gaspard, L, 850 (R F)
 Gater, B A R, 58 (Ent), 678 (Mal), 755 (B R)
 Gaud, M, 306 (Pl)
 Gauduchau, A, 483 (Bb)
 Genevray, J & Doderio, J, 646 (Rab)
 Geoghegan, A J, 217 (SS)
 George, P V & Webster, W J, 878 (Pl)
 Gerbuis, P, 265 (Lep), 458 (Mal)
 German, L, 824 (Misc)
 Getzowa, S, Stuart, G & Krikorian, K S, 150 (Rab)
 Ghaloungui, P, 905 (Pel)
 —, with Biggam, 280 (Am), 489 (Pel), 798 (Hel)
 —, with — & Hashim, 382 (Hel)
 Ghosh, B N, 706 (Mal)
 Ghosh, H, Gupta, B K S & Bose, S K, 47 (Chl)
 Ghosh, J L, with Roy & Nandi, 20 (Bb)
 Ghosh, N. N, with Chopra & Mukerji, 768 (Hel)
 Giamarchi, P & Sautet, J, 360 (Misc)
 Gibbins, E G, 56, 57, 60 (Ent), 460 (Mal), 812 (Hel)
 — & Loewenthal, L J A, 399 (Hel)
 Gibson, C R, with Stannus, 484 (Pel)
 Gibson, P. L & O'Flynn, J A, 660 (K A)
 Giemsa, G. & Oesterlin, M, 174 (Mal)
 Gigholi, G, 166 (Mal)
 Gilbert, A P W, with Soesilo, 474, 713 (Mal)
 Gilkes, H. A, 335, 751 (Misc)
 Gill, C A, 424 (Mal)
 Gill, J M., with Bhss, 504 (Y.F)
 Gillett, J D, with Wigglesworth, 746 (Misc.)
 Giller, R, with Chorine, 180, 435 (Mal)
 — & Tisseul, J, 555 (Lep)
 —, with —, 265 (Lep)
 Gilly, C, 328 (Misc)
 Ginsburg, J M, 711 (Mal), 741 (Misc)
 Giordano, A, 664 (K A)
 Giovanardi, A & Mondolfo, U, 765 (Hel)
 Giovannola, A, 455 (Mal)
 —, with Kikuth, 175 (Mal)
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 Girard, G., 884 (Pl)
 —, with Bablet, 307, 885 (Pl)
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Oropeza, P., 648 (Rab)
Ortega Nieto, L., 257 (Lep)
Oshiro, T., with Aoki, 892 (Chl)
Otomo, T., with Shoda & Koreyeda, 899
(Chl)
Otten, L., 35 bis (Pl)
Otto, G F., with Cordi, 395 (Hel)
— & Cort, W W., 789 bis (Hel)
Otto, R., 617 (Fev)
Ottolenghi, D., (726) (Mal)
—, with Cantacuzéne, Swellengrebel &
Pittaluga, 162 (Mal)
— & Rosa, A., (726) (Mal)
Ouchi, T., 37 (Chl)
Owen, H B., 16 (Oph)
Oyarzabal, J D., with Zuccarini, 217 (S S)

P

Paine, R W., 807 (Hel)
Pakiam, A X., 382 (Hel)
Paladino-Blandini, A., (73) (Ent)
— & Marino-Assereto, P., 713 (Mal)
Palant, B. L., with Tzekhnowitz, 631 (Fev.)
Pal Choudhury, B. K., with Morison & Rice,
891 (Chl.)
Paldrock, A., 538, (555) (Lep.)
— & Pooman, A., 549 (Lep.)
Pales, 350 (Misc)
— & Ponderoux, (362) (Misc.)
Pales, L., 572 (S S.)
Pallary, P., (400) (Hel.)
Pallster, R A., 396 (Hel.)
Palthe, van W., 668 (Misc.)
Pampana, E J., (725) (Mal.)
Panagia, A., 182 (Mal.), (824) (Misc)
Panayotatou, A., 245 (Fev)
Pandit, C. G., Menon K P. & Iyer, P V. S.,
33 (Pl.)
Parada Gay, M. A., with Varela, 631 (Fev.)

- Paraschivescu, Z., with Slatineanu, Nitulescu, Francke & Sibi, 904 (Pel.)
 Pardal, E., 304 (Pl)
 Pardina, J. M., (813) (Hel)
 Parker, R. R., with Davis, 249, 633 (Fev)
 —, with — & Walker, 634 (Fev)
 Parman, D. C., 50 *bis* (Ent)
 —, with Laake, Bishopp & Roark, 61 (Ent)
 Paroni, G., 280, (290) (Am)
 Parrino, G., 312 (Chl.)
 Parrot, L., (824) *bis* (Misc)
 —, Donatien, A. & Lestoquard, F., 229 (K A)
 —, with Sergeant, E., Sergeant, Et. & Donatien, 423 (Mal)
 —, with Sergeant, Et., Sergeant, Edm., Donation & Lestoquard, 226 (K.A.)
 Parulkar, R. D., 307 (Pl)
 Pasco, A. M., with Tubangu, 378 (Hel)
 Pasqual, J. H., 68 (Ent)
 Pasricha, C. L., de Monte, A. J. & Gupta, S. K., 42 (Chl)
 Patiño Camargo, L., with Kerr, 495 (Y.F)
 Paton, J. T., with Colvin & Dawes, (13) (Lep)
 Patrinos, I. & Catacouzenos, E., 150 (Rab)
 Patto, O. & Carneiro, J. M., 641 (Rab)
 Patton, W. S., 55 (Ent), 743, 744 (Misc)
 —, with Cushing, 359 (Misc.)
 Paulino, P. H., with Albert, 793 (Hel.)
 Pavlova, P., 700 (Mal)
 Pavlova, P. I., 468 (Mal)
 Payne, F., with Ashford & Payne, G. C., 122, 391 (Hel)
 Payne, G. C., with — & Payne, F. K., 122, 391 (Hel)
 Payne, S. A. & Perlzweig, W. A., 491 (Pel)
 Peaston, H., 382 (Hel)
 Pecori, G. & Escalar, G., 186 (Mal)
 Peel, with Schwetz & Baumann, 173 (Mal)
 —, with —, — & Belhommet, 410 (Mal)
 —, with —, — & Droeshaut, 418, (474) (Mal)
 Pelikan, E. R., with Hart, 887 (Pl)
 Pennington, R. G., (362) (Misc.)
 Penna, H., with Soper, Cardoso, Serafim, Jr., Frobisher, Jr. & Pinheiro, 77 (Y F)
 Penna, H. A., with Lloyd & Mahaffy, 81 (Y.F.)
 —, with Mahaffy & Lloyd, 78 (Y F)
 Penso, G., 127, 383 (Hel), 589 (S.S.), (824) (Misc)
 Perlzweig, W. A., with Payne, 491 (Pel.)
 Peschkowsky, J. W., 553 (Lep.)
 Peshkov, H., 279 (Am)
 Peter & Gahtgens, 819 (Misc.)
 Peter, F. M. (726) (Mal)
 Petigara, P. M., (726) (Mal.)
 Pettit, A. & Stefanopoulo, G. J., 79, 838 (Y.F.)
 Petruschewsky, G. K. & Tarassow, V., 121, (Hel.)
 Petzetakis & Karalis, 250 (Fév)
 Petzetakis, M., 95, (855) (Lept)
 Peyri, A., (874) (Lep.)
 Pezzeri, V., 704 (Mal.)
 Pham-Huu-Chu, with Lemierre & Layani, 620 (Fev.)
 Phleng, with Tirouvanziam, (727) (Mal)
 Philp, C. B., 503 (Y F)
 —, with Jellison, 69 (Ent)
 Picard, R., 138 (Sp)
 Piccininni, F., 416 (Mal)
 Pieraerts, G., with Konne, 584 (S.S.)
 Pieri, J. & Lena, D., 235 (K A)
 Pierret, R., 336 (Misc)
 Pijper, A., 771 (Hel)
 — & Dau, H., 241 (Fev)
 Pikul, I., with Tareev, Epstein, Gontaeva & Raskin, 698 (Mal)
 Pikul, N., with Koldajew, 638 (Rab)
 Pilz, H., with Mooser & Varela, 621 (Fev)
 Pinard, M., (727) (Mal)
 Pinelli, L. & Masia, A., (190) (Mal)
 Pines, A. I., with Kritschewski, 698 (Mal)
 Piney, A., 520 (B R)
 Pinheiro, J., with Soper, Penna, Cardoso, Serafim, Jr. & Frobisher, Jr., 77 (Y F.)
 Pirot, R. & Le Moulit, 356 (Misc)
 —, with Plazy & Marcandier, (636) (Fev.)
 Pittaluga, G., with Cantacuzéne, Ottolenghi & Swellengrebel, 162 (Mal.)
 Plantilla, F. C., with Rodriguez, 865 (Lep.)
 Plantureux, E., 146, 647 (Rab)
 Plantureux, R., 152 (Rab.)
 Plazy, Marcandier & Pirot, (636) (Fev.)
 Plazy, L. & Damany, P., 120 (Hel), (252) (Fev)
 Poundexter, H. A., 281 (Am), 594 (S.S.)
 — & Jones, R. F., 804 (Hel)
 Pokrouskaja, M., 882 (Pl)
 Poleff, L., 859 (Oph)
 Poljak, I. & Toumansky, V., 31 (Pl)
 Polltzer, R., with Wu Lien-Teh, Chun & Wu, 519 (B R)
 Pons, J. A. & Hoffman, W. A., 381 (Hel)
 —, with — & Janer, 778 (Hel)
 Pons, R., 308 (Pl), 817 (Misc.)
 — & Advier, 34 (Pl)
 Pontes, J. de P. L., (727) *bis* (Mal)
 —, with Velho-Da-Silva, 816 (Misc.)
 Pookels, W., 823 (Misc.)
 Pooman, A., with Paldrock, 549 (Lep.)
 Popesco, C., with Combiesco, 242 (Fev.)
 —, with —, Stamatesco & Angelesco, 245 (Fev)
 —, with — & Vantu, 626 (Fev.)
 Popesco-Combiesco, C. & Soru, E., 894 (Chl.)
 Popesco, F., 134 (Hel)
 Popoff, with Gontier, 513 (R F.)
 Popow, P. P. & Golszowa, R. D., 49 (Ent)
 Portelly, J., 632 (Fev)
 Porter, A., 750 (Misc)
 Postmus, S., with Snijders & Schuffner, 840 (Y.F.)
 Pottier, R., with Van den Branden, 207 (S.S.)
 Potts, W. H., 65 (Ent)
 Poudroux, with Pales (362) (Misc.)
 Pousson, A., (362) (Misc.)
 Poutchkova, A. I., with Tarejew, 458 (Mal.)
 Póvoa, H., (400) (Hel)
 Predteschenskaja, L., with Glusman & Ssolowiewa, 151 (Rab.)
 Prendel, A. R., Zagorovskii, N. A. & Futran, G. S., 471 (Mal)
 Previtera, A., 635 (Fev.), 664 (K.A.)
 Prigge, R., with Kolle, 331 (Misc.)

- Prince, F M., with Hull & Dove, 745 (Misc)
 Proca, G., Bobes, S. & Jonnesco, D., 642 *bis* (Rab)
 Proceedings of the Royal Society of Medicine, 814 (Misc)
 Prommas, C. & Daengsvang, S., 801 (Hel)
 Prudhomme, R., with Chorine, 867 (Lep)
 Pruus, G W A., 122 (Hel)
 Puente, J J., with Balna, (266) (Lep)
 Pund, E R. & Mosteller, R., 802 (Hel)

Q

- Quarfe, W T., 711 (Mal.)

R

- Rabello, E., (13) (Lep)
 Rabi, R., 334 (Misc)
 Radacovic, E., with Ionesco-Miabaesti, Zotta & Badenski, 707 (Mal)
 Radhakrishna Rao, M V., 342 (Misc.)
 Radsma, W., Streef, G M. & Klerks, J V (362), 669 *bis* (Misc)
 Raffel, S., 586 (S.S.)
 Ragot & Delbove, (96), 854 (Lept)
 Ragle, B H., with Urmy, Allen & Jones, 481 (Bb.)
 Rajadhyaksha, B. H., (29) (Pel)
 Rajamanikam, N., with David & Krishnaswamy, 821 (Misc)
 Ramachandran, A S., with Mudaliyar & Sundaram, 230 (K A.)
 Raman, T. K., 26 (Pel)
 Ramirez, J., with Schobl, Hirano, Vazquez-Colet & Arima, 96 (R. B.F.)
 Ramos, J. M., with de Jesus & de Leon, 350 (Misc.)
 Ramsay, G W St C., 378 (Hel)
 Rankov, M., 685 (Mal)
 Rao, B A., (475) (Mal)
 Rao, M. A. N., 378 (Hel)
 Rao, S. S., 134 (Hel.)
 Raskin, with Tarejev, Epstein, Gantaeva & Bolotina, 174 (Mal)
 Raskin, A., with Tareev, Epstein, Pikul & Gontaeva, 698 (Mal)
 Ratchliffe, H L., 287 (Dys.)
 Rawlings, I D., with Bundesen & Fishbein, (289) (Am.)
 Ray, N N., 405 (Oph)
 Raybaud, A., 796 (Hel), 881 (Pl)
 Raynal, J., with Bernard & Liang, 43 (Chl)
 — & Le Gac, P., 60 (Ent), 231 (K A)
 Razafinjato, with Legendre, 779 (Hel)
 Read, B. E., 548 (Lep)
 Reed, A. C., (655) (Am)
 —, with David, Johnstone & Leake, 283 (Am.)
 — & Johnstone, H. G., 649 (Am.)
 Reed, G. B., 10 (Lep)
 Reenstierna, J., 265 (Lep.)
 Reeves, R. J. & Apple, E. D., 281 (Am.)
 Reichs-Gesundheitsblatt, 149 (Rab.)
 Reiner, L. & Chao, S S., 212 (S.S.)
 —, with Smythe, 580 (S.S.)
 Reither, R., 716 (Mal)
 Reitler, R., with Scott & Ayoub, 794 (Hel)
 Reitz, H., 549 (Lep)
 Reko, V. A., (13) (Lep)
 Remlinger, P., 145 (Rab)
 — & Bailly, J., 146 *quat*, 148, 639, 640, 647 *bis* (Rab)
 Revue de Microbiologie, d'Epidémiologie et de Parasitologie, 882 (Pl)
 Reynal, J. & Wassilheff, A., 35 (Pl)
 Rhoads, C P., with Miller, 140 (Sp)
 Ribeyro, R. E., 253 (Fev)
 Ricci, E., (824) (Misc)
 Rice, C E., Drake, A A. & Smith, J E., 858 (Oph)
 Rice, E. M., with Morison & Pal Choudhury, 891 (Chl)
 Rickard, E R., with Soper & Crawford, 836 (Y F)
 Ricks, H C., with Keller & Leathers, 795 (Hel)
 Riley, W A. & Liang-Yu, W., 55 (Ent)
 — & Scheffey, C H., 801 (Hel)
 Riou & Moyné, 202 (S S)
 Riou, M., 340 (Misc), 400 (Hel)
 —, with Advier, 883 (Pl)
 —, with Advier & Alain, 848 (R F)
 — & —, 235 (K A)
 —, with Blondin, 340 (Misc)
 Ripley, H S. & van Sant, H M., 856 (R B F)
 Riseman, J E F., with Ernstene, 237 (Fev)
 Rivera Bandres, J., 234 (K A)
 Rivera, J., 234 (K A)
 Ruvoalen, P., with Sicé & Cousin, 203 (S S)
 Riwkuna, S L., with Isabolinski, Sobolewa, Stratanowitsch & Moskalewa, 619 (Fev)
 Roark, R C., with Laake, Parman & Bishopp, 61 (Ent)
 Robatto, A G., (813) (Hel)
 Robic, J., 32 (Pl)
 —, with Girard, 885 (Pl)
 Robin, L., 154 (Mal)
 Robin, L A., 412, 414 (Mal)
 — & Toumanoff, C., 701 (Mal)
 Robineau, M., 539 (Lep)
 Robinson, W. & Simmons, S W., (824) (Misc.)
 Rockefeller Foundation, 222 (B R)
 Rode, P., 877 (Pl)
 Rodenbeck, 149 (Rab)
 Rodenwaldt, E., 183 (Mal)
 Rodhaun, J., 419 (Mal)
 — & van Hoof, M T., 377 (Hel)
 Rodieux, M., with Chorine, 457 (Mal)
 Rodrigues, S L., 8 (Lep.)
 Rodriguez, J., (73) (Ent)
 —, Mabalay, E. & Tolentino, J C., 265, (874) (Lep.)
 — & Plantilla, F C., 865 (Lep.)
 Rogers, L., 349 (Misc.)
 Roig I Roig, M., 149 (Rab.)
 Rojas, E S., with Molina & Hoffman, (813) (Hel.)
 Romaña, C., 599 (S.S.)
 Ronchèse, A D., with d'Oelsnitz, 658 (K.A.)
 Ronka, E. K. F., (813) (Hel)
 Ronse, M., 625 (Fev)
 Roques, H., 14 (Oph.)
 Roques, F., with Huard & Dejou, (655) (Am)
 Rosa, A., with Ottolenghi, (726) (Mal.)
 Roscoe, M H., 491 *ter* (Pel)

- Rose, F G, 539 (Lep)
 Roskott, E. R A L., (515) (Lept)
 Rostkowski, L., 402 (Oph)
 Roton, with Souchard, 8 (Lep)
 Roubaud, E., 424, 724 (Mal)
 — & Colas-Belcour, J., 58 (Ent), 720 (Mal)
 — & Treillard, M., 715, 718 (Mal)
 Rouesse, with Martin & Chassigneux, 689 (Mal)
 Rousse, 328 (Misc)
 Row, R, Dalal, N P & Gollerkeri, G V., 172 (Mal)
 Roxburgh, A C., (13) (Lep)
 Roy, B C, Nandi, P & Ghosh, J L, 20 (Bb)
 Roy, D N, with Strickland, 178 (Mal)
 de Rozario, C F, 32 (Pl)
 Rozeboom, L E & Shah, K S, 701 (Mal)
 Ruata, V, 858 (Oph)
 Rubinstein, P L, with Kritschewski, 241 (Fev)
 Rud, E, 904 (Pel)
 Rudd, E T S, with O'Flynn, (824) (Misc.)
 Ruffin, J. M & Smith, D T, 490 (Pel)
 Rugg-Gunn, A., 405 (Oph)
 Russell, F. F., (504) (Y F)
 Russell, P F, 160, (190), 430, (436) (Mal), 765 (Hel)
 — & Nono, A M, 681 (Mal)
 — & Santiago, D, 720 (Mal)
 Ruys, A C, 94 (Lept)
 Ryrie, G A, 8, 542, 864 (Lep)

S

- Sabry, I, 901 (Pel)
 Saenz, A, with Coste & Costil, 276 (Y & S)
 St John, J H., 283 (Am)
 Santon, J, with Brumpt & Duvoir, 787 (Hel)
 Saiternik, Z, 58 (Ent)
 Salle, A. J, 871 (Lep)
 —, with Emerson, 547 (Lep)
 — & Moser, J R, 553 *bis* (Lep)
 Sampedro, M M., (727) (Mal)
 Sanchez, E., with Vicente Paniagua, (92) (R F)
 Sanchis Bayarn, V, 289 (Dys)
 — & Montolu Volant, C., 658 (K.A.)
 Sanderson, I, with Mackay & Buchanan, 470 (Mal)
 Sandosham, A A., (813) (Hel.)
 van Sant, H. M., with Ripley, 856 (R.B F)
 Santiago, V., (874) (Lep.)
 Sanyal, S, 17 (Oph)
 Sapeika, N., 697 (Mal)
 Sardjito, (92) (R.F)
 —, with Bergman & Sitanala, 263 (Lep.)
 — & Sitanala, J. B, 550 (Lep.)
 Sarkar, S. L. & Gupta, B. M, 21 (Bb.)
 Sarnelli, T., (362) (Misc.)
 Sassuchin, D., 359 (Misc.)
 Sato, S., 130, (137) (Hel.)
 Saubidet, E. J., with Cibils Aguirre, (289) (Am.)
 Saura Fargas, J., (514) (R.F.)
 Sautet, J., 465, 685 (Mal)
 —, with Benelli & Zuccarelli, 660 (K A)
 —, with Galliard, 722 (Mal)
 —, with Giamarchi, 360 (Misc)
 Santiago, D, with Russell, 720 (Mal)
 Savage, J de la M., 411 (Mal)
 Savignoni, F. & de Maria, G., (400) (Hel)
 Savino, E., (888) (Pl)
 Sawhney, M R, 405 (Oph.)
 Sawyer, W A, 837 *bis* (Y F.)
 Sayers, E G, 821 (Misc)
 Scaduto, P, 393 (Hel), (636) (Fev)
 Scalas, A, with Tedeschi, 415 (Mal.)
 Scamarcio, F C, with Andreotti, 392 (Hel)
 Scannell, D D, (290) (Am.)
 Scaturro, A., (636) (Fev)
 Schapiro, L, 468 (Mal)
 Scharer, B, 853 *bis* (R F)
 Schenley, C H, with Riley, 801 (Hel)
 Schennberg, P, with Advier, (219) (S S)
 Schichobalowa, N, with Bransburg & Gorelik, 782 (Hel)
 Schilling, C., 702 (Mal)
 — & Neumann, H, 167 (Mal.)
 —, with Schreck, H., Neumann, H & Kunert, H, 213, 586 (S.S)
 Schlossberger, H, with Fischl, 518 (B.R.)
 — & Menk, W, 103 (Sn)
 Schlossmann, K, 9 (Lep)
 Schöbl, O, Hirano, H, Vazquez-Colet, A., Ramirez, J & Arima, S., 96 (R B F)
 Schoen, R, with Levaditi, 145 (Rab)
 —, with — & Levaditi, J, 638 (Rab)
 —, with — & Vaisman, 855 (R.B F)
 Scholtens, R T, 312 *bis* (Chl)
 Schottmuller, (141) (Sp)
 Schousboe, 403 (Oph)
 Schreck, H, with Schilling, Neumann & Kunert, 213, 586 (S S)
 Schöffner, W, 853 (Lept)
 Schuffner, W A. P, with Klarenbeek, (96) (Lept)
 —, with Snijders & Postmus, 840 (Y F.)
 Schutze, H., 886 (Pl)
 Schwartz, S C, with Andrews & Johnson, 283 (Am)
 Schweinburg, F., with Löffler, 640 (Rab.)
 Schwennicke, H, 783, 788 (Hel)
 Schwetz, J, 91, 509 (R.F), 461, 462, 681, 708, (727) *bis* (Mal), 587 (S S)
 —, Baumann, H. & Peel, 173 (Mal)
 —, —, — & Belhomme, 410 (Mal.)
 —, —, — & Droeshaut, 418, (474) (Mal)
 — & Kadaner, 817 (Misc)
 Scott, G W, 712 (Mal)
 Scott, J. A, Ayoub, G E & Rentler, R, 794 (Hel)
 Scrimgeour, H, 351 (Misc)
 Scuderi, G, 129 (Hel)
 Sebrell, W H, 902 (Pel.)
 Sedan, J., 16, 402 (Oph)
 Seeley, S F., 6 (Lep.)
 See-Lü, H., 691 (Mal)
 Séguy, E., (362) (Misc.)
 Seiffert, W, with Uhlenhuth, 351 (Misc)
 Selfa, E., 859 (Oph)
 Sellards, A. W. & Laigret, J., 501 (Y.F)
 Semenova, N E, 803 (Hel.)

- Semikov, F., & Achourova, I., 883 (Pl)
 Sen, B., with Chopra, 652 (Am)
 —, with — & Sen, S., 652 (Am)
 —, with Sen, S. & Chopra, 282 (Am)
 Sen, S., with Chopra & Sen, B., 282, 652 (Am.)
 Senevet, G., 722 (Mal)
 — & Collignon, E., 156, (727) (Mal.)
 — & Lièvre, H., 769 (Hel)
 Serafim, J., Jr., with Soper, 502 (Y F)
 —, with —, Penna, Cardoso, Frobisher, Jr. & Pinheiro, 77 (Y F)
 Serebrennaja, A. I., Grunfeld, A. A. & Neumann, M. W., 243 (Fev)
 Serebrjannaja, A. I., with Grunfeld & Neumann, 622 (Fev)
 Seretettin, O., 857 (R B F)
 Sergeant, A., 88 (R F)
 —, Manceaux, A. & Balliste, R., 87 (R F)
 —, with Sergeant, Et., 361 (Misc.)
 — & Vogt, P., 432, 433, 697 *bis* (Mal)
 Sergeant, E., Sergeant, Et. & Catanei, A., 418, (436), 704 (Mal)
 —, —, Parrot, L., Donatien, A. & Lestoquard, F., 226 (K.A.)
 —, —, —, —, —, 423 (Mal)
 Sergeant, Et. & Sergeant, A., 361 (Misc)
 —, with Sergeant, Edm. & Catanei, 418, (436), 704 (Mal)
 —, with —, Parrot, Donatien & Lestoquard, 226 (K.A.)
 —, with —, —, —, —, 423 (Mal.)
 Sfameni, A., 126 (Hel)
 Shah, K. S., with Lal, 410 (Mal)
 —, with Rozeboom, 701 (Mal.)
 Shahn, M., 683 (Mal)
 Shapiro, J. M., 683 (Mal)
 Sharma, L. R., with Napier, 232, 664 (K.A.)
 Sharp, L. E. S., 542 (Lep)
 Shattuck, G. C., in collaboration with others, 223 (B.R)
 — & Hilterty, M. M., 192 (H S)
 Shearer, G. D., 389 (Hel.)
 Shiga, K., 286 (Dys)
 Shillong, 314 (Chl)
 Shimojo, K., Soda, T. & Adachi, K., 37 (Chl)
 Shlenova, M. F., (727) (Mal)
 Shoda, T., Koreyeda, T. & Otomo, T., 899 (Chl.)
 Shorb, D. A., 117 (Hel)
 Shortt, H. E., 648 (Rab)
 — & Brooks, A. G., 638 (Rab)
 — & Lahiri, B. N., 641 (Rab.)
 —, Malone, R. H., Craighead, A. C. & McGuire, J. P., 642 (Rab)
 Shrivastava, D. L., with Linton, 39, 313 *bis* (Chl.)
 —, with — & Mitra, 313, 892, 893 (Chl)
 Shute, P. G., 51 (Ent.)
 Sibi, M., with Slatineanu, Nitulescu, Cantacuzino & Lupu, 904 (Pel.)
 —, with —, —, Francke & Paraschivescu, 904 (Pel)
 —, with —, —, — & Veit, 904 (Pel.)
 Sicard, M., 513 (R.F.)
 Sicault, G., 712 (Mal)
 — & Decourt, P., 431, 432 (Mal)
 Sicé, A., 31 (Pl), 577 (S.S.)
 Sicé, A., Cousin, E. & Dantec, 577 (S.S.)
 —, — & Rivoalen, P., 203 (S.S.)
 —, with Moustardier, Mercier & Varneau, 573 (S.S.)
 Silber, L. A. & Dossère, E. M., 623 *bis* (Fev)
 Simić, T., 284 (Am)
 Simmonds, H. W., 358 (Misc)
 Simmons, S. W., with Robinson, (824) (Misc)
 Simons, L. H., 541 (Lep)
 Sinai, I., 900 (Pel)
 Sincke, G. E., (362) (Misc)
 Singer, E. & Fischl, V., 510 (R F)
 —, with —, 851 (R F)
 —, with — & Kotrba, 510 (R.F.)
 —, Kotrba, J. & Fischl, V., 851 (R.F.)
 Singh, B., with Jafar, 255 (Fev)
 Sinton, J. A., 691, 706, (825) (Mal)
 —, with Christophers & Covell, 517 (B.R)
 —, with Majid, 182 (Mal)
 — & Mulligan, H. W., 461 (Mal)
 —, with Mulligan, 462 (Mal)
 Sitanala, with Bergman & Sardjito, 263 (Lep)
 Sitanala, J. B., with Sardjito, 550 (Lep)
 Slatineanu, A., Nitulescu, J., Francke, M., Sibi, M. & Paraschivescu, Z., 904 (Pel.)
 —, —, Sibi, M., Cantacuzino, L. & Lupu, E., 904 (Pel)
 —, —, —, Francke, M. & Veit, E., 904 (Pel.)
 Shwensky, M., 415 (Mal)
 van Slype, W., 250 (Fev.)
 Smart, A. G. H., 99 (Sn.), 541 (Lep)
 Smith, D. T., with Ruffin, 490 (Pel)
 Smith, E. C., 497 (Y.F.), (825) (Misc)
 — & Elmes, B. G. T., 274 (Y & S)
 Smith, J. E., with Rice & Drake, 858 (Oph)
 Smith, J. H., 490 (Pel)
 Smith, R. O. A., 233 (K.A.)
 —, with Krishnan & Lal, 179, 463 (Mal.)
 —, with Napier, 661 (K.A.)
 —, with — & Gupta, 227 (K.A.)
 —, with — & Krishnan, 228, 229, 663 (K.A.)
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